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SAFETY AND GOOD LABORATORY PRACTICE MANUAL

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Date: 23/07/2021	Date: 10/09/2021	Date: 22/09/2021

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INDEX

1. PURPOSE OF THE SAFETY MANUAL	5
2. UNIVERSITY LABORATORIES	5
3. TYPE OF RISK	6
3.1. PHYSICAL RISKS	8
Mechanical	8
Thermal	8
Electromagnetic	9
3.2. CHEMICAL RISKS	10
What is a chemical hazard?	10
Signage and labelling	11
H-phrases and P-phrases	12
Safety Data Sheet	19
Table of incompatibilities	21
Absorption and neutralization procedures	22
3.3. BIOHAZARDS	24
What is biohazard?	24
Elimination and reduction of risks	25
Handling of biological agents	26
4. PROTECTIVE EQUIPMENT IN THE LABORATORY	26
4.1. COLLECTIVE PROTECTIVE EQUIPMENT	26
Extractor hoods	26
Biological Safety Cabinets	27
4.2. SELECTION AND USE OF PPE	28
4.3. TYPES OF EPI MOST COMMONLY USED IN THE LABORATORY	31
Gloves	31
Face and eye protection	33
Respiratory protection	36
Noise protection	40
Foot protection	40
5. WORK CLOTHES	42
Gown	42
Aprons	42
6. EQUIPMENT FOR EMERGENCY USE	43
Eyewash	43
Safety showers	44
Fire safety equipment	45

7. MANDATORY LABORATORY STANDARDS	49
7.1. GENERIC STANDARDS	49
Personal Habits and Clothing ……	49
Working habits ……...	50
Specific standards for microbiology or pathogen laboratories ……..	51
General waste management standards ……...	51
7.2. GOOD LABORATORY PRACTICE ……..……	52
Good practices in the use of resources ……..	52
Product storage ……..	53
8. STANDARD OPERATING PROCEDURES SOW …….	55
9. MANAGEMENT OF HAZARDOUS WASTE AT THE ULE AND ITS LABORATORIES ……	56
9.1. URBAN ASSIMILABLE WASTE ……..……	56
9.2. BIOLOGICAL/SANITARY WASTE ……..……	57
9.3. CHEMICAL WASTE ……..…….	58
9.4. RADIOACTIVE WASTE ……..……...	62
10. WHAT TO DO IN CASE OF A FIRE EMERGENCY? ……	63
If you detect a fire ……..…..	64
If you are trapped ……..	64
11. WHAT TO DO IN CASE OF AN ACCIDENT? …….	64
Protocol website ……...……	64
12. HEALTH SURVEILLANCE …….	66
13. BIBLIOGRAFHY ……..	66
Annex 1 …….	67
Annex 2 …….	69
Annex 3 …….	70
Annex 4 …….	71

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Laboratory Safety and Good Laboratory Practice Handbook

Prepared by the L.R.P. Unit of the U.Le. September 2021)

1. OBJECTIVE OF THE SECURITY MANUAL

Teaching and research activities carried out in laboratories at the University of León (U.Le.) may, in certain cases, involve possible exposure to risks whose potential seriousness depends on the type of work carried out and the means of protection and prevention available in each case.

The work in the laboratory, including in the research laboratory, with non-regular staff, doctoral students, researchers, postdocs, etc., is duly hierarchical, with clearly defined chains of responsibilities established in the

P.R.L. Plan of the U.Le. (consulted in the Health and Safety Committee of 27/05/2019, approved by the Governing Council of 16/07/2019 and published on the website of the University of León).

This Manual considers the indications established to carry out safe and healthy work in laboratories at the U.Le., basically in accordance with the current legislation on Occupational Risk Prevention, the Environment and waste management.

Target audience: **teachers** and **researchers** (P.D.I.), including also **research "scholarship holders"** and **third cycle students**, who start their first laboratory experiences. It should also be known by all **administrative and service staff** (P.A.S.) involved in laboratory work. In particular, this Manual must be read and known by the **researchers in charge of projects** and by all the **scientific and technical research "grant holders"** who begin their work at the U.Le.

The attached acceptance document (Annex.- 1) must also be signed and dated and kept on file (by the Principal Investigator, Subject Leader, etc.).

2. UNIVERSITY LABORATORIES

The U.Le. has different types of laboratories, whose potential risks are directly related to the activities carried out and the materials and equipment handled in them.

The different types of laboratories at the University of León are **León Campus:**

- Analysis and Experimentation Laboratories, Organic and Inorganic Chemistry, Analytical Chemistry, Applied Chemical Engineering, Physical Chemistry, Physics, Food Technical Biochemistry, Pharmaceutical Technology, Microbiology Laboratories**,** Parasitology, Medical Microbiology, Epidemiology, Virology.
- Radioactive Isotope Laboratories, Ecology Laboratories, Physics Laboratories, Electronics Laboratories, Signal and Communication Theory Laboratories, Biology Laboratories, Zoology, Physical Anthropology, Botany, Genetics, Ecology, Cell Biology, Molecular Biology, Plant Physiology, Medicine Laboratories, Physiology, Medical Specialities, Surgery, Anatomy, Pharmacology, Laboratories Animal Experimentation Centre laboratories, laboratories of Geology, Architecture laboratories, Automation laboratories.

Institutes on the León Campus (Biology/Microbiology/Medicine):

- IBIOMED: Institute of Biomedicine
- INBIOMIC: Institute of Molecular Biology, Genomics and Proteomics
- INDEGSAL: Instituto de Desarrollo Ganadero y Sanidad Animal (Institute for Livestock Development and Animal Health).

Ponferrada Campus:
Physiology Laboratory, Medical-Surgical Laboratory, Microbiology Laboratory, Biochemistry Laboratory, Toxicology and Pharmacology Laboratory, Anatomy Laboratory, Thermotechnics Laboratory, Ecology Laboratory, Genetics Laboratory, Microbiological Control Laboratory, Geology Laboratory, I.T. in Topography Laboratory, Photography Laboratory, Basic Operations Laboratory, Chemistry Laboratory, Dairy and Oenology Laboratory, Phytotechnics Laboratory, Botany Laboratory, Physics Laboratory, Selector's Laboratory, Chemistry Laboratory, Dairy and Oenology Laboratory, Phytotechnics Laboratory, Botany Laboratory, Physics Laboratory, Chemistry Laboratory. in Topography, Photography laboratory, Basic Operations laboratory, Chemistry laboratory, Dairy and Oenological Industries laboratory, Phytotechnics laboratory, Botany laboratory, Physics laboratory, Forestry laboratory, Zoology laboratory, Automata laboratory, Engines and Machines laboratory, Mountain Defence laboratory, Community Health laboratory, Physiotherapy laboratory, Muscle and Joint Assessment laboratory, Dasometry laboratory, Quality Control laboratory, Electrical Engineering laboratory.

The operation of these laboratories should be in accordance with the standards established for the activities carried out in these laboratories.

3. TYPES OF RISKS

In accordance with current legislation on the Prevention of Occupational Risks, the following is understood to mean:

· PREVENTION - the set of activities or measures taken or planned at all stages of a company's activity in order to avoid or reduce the risks arising from work.

· OCCUPATIONAL RISK - the possibility that a worker may suffer a particular injury arising from work. In order to qualify a risk from the point of view of its seriousness, the probability of the harm occurring and the severity of the harm shall be assessed together.

· Illnesses, pathologies or injuries suffered as a result of or in connection with work shall be considered as WORK RELATED YEARS.

· SERIOUS AND IMMINENT OCCUPATIONAL RISK - a risk that is rationally likely to occur in the immediate future and could result in serious harm to the health of workers.

In the case of exposure to agents likely to cause serious harm to the health of workers, a serious and imminent risk shall be deemed to exist where it is reasonably probable that exposure to such agents will occur in the immediate future and serious harm to health may result, even if it is not immediately apparent.

· POTENTIALLY HAZARDOUS processes, activities, operations, equipment or products are understood to be those which, in the absence of specific preventive measures, give rise to risks to the safety and health of the workers who carry them out or use them.

· WORK EQUIPMENT - any machine, apparatus, instrument or installation used in the work.

· WORKING CONDITION - any characteristic of the work that may have a significant influence on the generation of risks to the safety and health of the worker. They are specifically included in this definition:

The general characteristics of the premises, installations, equipment, products and other tools existing in the workplace.

The nature of the physical, chemical and biological agents present in the working environment and their corresponding intensities, concentrations or levels of presence.

The procedures for the use of the above-mentioned agents that influence the generation of the above-mentioned risks.

All other characteristics of the work, including those relating to its organisation and layout, which influence the extent of the risks to which the worker is exposed.

· PERSONAL PROTECTIVE EQUIPMENT any equipment intended to be worn or held by the worker to protect him from one or more hazards likely to threaten his safety or health at work, and any accessories or attachments intended for that purpose.

The risk rating is defined in terms of its severity. The probability of the damage occurring and the severity of the damage are assessed together.

On the basis of this definition, a distinction can be made:

a) **SAFETY Risks** per: they can potentially cause Occupational Accidents (any bodily injury suffered by the worker in course of his work).

b) **INDUSTRIAL HYGIENE RISKS: these** can potentially lead to occupational diseases (slow and gradual deterioration of the worker's health due to exposure to certain risks linked to the working environment).

c) **ERGONOMICS and APPLIED PSYCHOSOCIOLOGY risks:** related to the suitability of the workplace for the person, repetitive movements, stress, dissatisfaction, etc.

This Manual mainly considers risks that can potentially trigger Occupational Diseases (IDs), i.e. potential safety, ergonomic and applied psychosociological risks are virtually NOT considered.

RISKS LINKED TO THE WORKING ENVIRONMENT

When dealing with risks linked to the environment at work, we refer to all those factors generated in the development of the work activity and may affect the health of the worker, as they affect the air environment in which he/she finds him/herself.

The different risks to which a worker may be exposed in the environment can be classified according to the type of agent that causes them. Thus, the different agents can be classified according to their nature as follows:

• Physical agents.

A. Risks caused by physical agents

A.1. Mechanical: Noise (considering occupational deafness) and vibrations (considering hand-arm or whole- body subsystems).

A.2. Thermal: Cold or heat (considering situations derived from extreme exposures), or derived from comfort or discomfort (related to ergonomics).

A.3. Electromagnetic:

a) Possible exposure to ionising radiation (from the point of view of P.R.L. only the risk is identified and it is the Nuclear Safety Council that determines the risk assessment and the pertinent preventive and protective measures to be adopted in each case).

b) For possible exposure to non-ionising radiation: Ultraviolet, Visible, Infrared, etc.

• Chemical agents.

B. Risks arising from possible exposure to chemical agents: particulate matter (dust or fibres); acids or bases (corrosive agents); solvents (volatile agents); carcinogenic, mutagenic or toxic for reproduction; heavy metals; etc.

• Biological agents.

C. Risks arising from possible exposure biological agents. Biological agents are classified into four groups (1, 2, 3 and 4) according to the potential severity of the disease they can cause in humans, the existence or not of one or more treatments and/or prophylaxis and their capacity to cause a pandemic; group 4 includes biological agents capable of causing very serious and lethal diseases, for which there are no adequate treatments or prophylaxis and which are capable of triggering a pandemic.

3.1 Physical Risks:

A.1. Mechanics

What is noise?

Noise is when a set of sounds is considered annoying. It is therefore a subjective concept: the same sound can be considered useful, pleasant or annoying depending on who hears it and at what time it is heard; but when the sound level is very high, although in some cases it can be considered pleasant, it can constitute a health hazard. The P.R.L. legislation establishes reference values to prevent occupational hearing loss (deafness) by differentiating between peak levels (which should not be exceeded at any time during exposure) and weighted equivalent daily levels (established for working hours of 8 hours per day or 40 hours per week).

Vibrations:

The legislation establishes the reference values for hand-arm vibration and whole-body vibration, differentiating between acceptable, risky or intolerable situations and establishing the appropriate monitoring, control and preventive measures. The most frequent and studied effects are respectively Raynaud's Syndrome or vibration- induced white finger and possible cervical or dorsal-lumbar injuries.

A.2. Thermals

Heat is the only "pollutant" that can be generated by the human body, which is why it has natural defence mechanisms. The human being needs to maintain an internal temperature of approximately 37 ºC +/- 1 ºC for the development of life; to achieve this he possesses physical and physiological mechanisms. The risk to a worker's health begins when the environmental conditions are capable of exceeding the capacity of the self- defence mechanisms and is related to the physical requirements of the tasks to be performed, the clothing and the external conditions of temperature, relative humidity, wind speed, etc.

Cold:

Work at very low temperatures or making use of materials kept at very low temperatures, e.g. work in or access to freezing chambers (generally at -20 °C),

work with samples and/or substances kept in freezer cabinets (generally at - 80 °C), work with liquid nitrogen, etc.

In general, work in freezing chambers involves minimum exposure times (the time necessary to access the chamber and take the required sample); the main risk is due to the fingers of the hands sticking to the frozen container or surface. Work with samples preserved at -80°C involves, in addition to the above-mentioned risk, possible splashing (e.g. with liquid nitrogen) or possible asphyxiation due to displacement of ambient oxygen.

For work with possible exposure to low temperatures due to inclement weather, it is generally advisable to wear suitable clothing.

For heat:

Working at very high temperatures or using materials or equipment that work or have been exposed to very high temperatures, for example: muffles or cookers (generally at 800 ºC or 90-100 ºC).

In general, work involving the use of crucibles in muffles or glass material in cookers, etc. involves minimal time and it is necessary to proceed in accordance with stipulated procedures (which in turn often stipulate the mandatory use of certain Collective Protective Equipment and/or Personal Protective Equipment (PPE)); the main risk arises from possible gas or vapour emissions, splashes and burns.

For work with possible exposure to high temperatures due to inclement weather, acclimatisation, adequate hydration (with replenishment of mineral salts eliminated by perspiration), skin protection (in case of direct exposure to sunlight) and a cap, hat or similar are essential.

A.3. Electromagnetic

One form of energy transmission is through electromagnetic wave radiation. Electromagnetic waves differ from one another in the amount of energy they are capable of transmitting, and this depends on their frequency.

Ionising radiation:

They are the most energetic, having so much energy that they are capable of interacting with matter (giving rise to electrically charged particles, called ions). Ionising radiation can be electromagnetic, such as X-rays and gamma rays, or corpuscular (component particles of atoms that are emitted, such as alpha and beta particles). Exposure to ionising radiation can cause very serious and irreversible damage to health (including cancer).

As indicated above, P.R.L. identifies the risk and the Nuclear Safety Council is the official body (or companies authorised by it in each Autonomous Community) that determines the risk assessment, specific training required, inspections, health surveillance and the pertinent preventive and protective measures to be adopted in each case, in accordance with the relevant legislation (radiodiagnosis equipment, radioactive facilities, etc.).

Non-ionising radiation:

Non-ionising radiation can have different effects on the human body, depending on the frequency band involved. Laser radiation can be extremely dangerous by projecting a large amount of energy onto a very small surface.

Ultraviolet (U.V.) radiation can cause skin conditions (redness and even burns) or conjunctivitis due to eye exposure.

Visible light causes other problems that are often less serious but more common. These are problems related to lighting and are generally considered from an ergonomic and psychosocial point of view. The most common problems are related to the type of existing lighting and the visual requirements necessary for the tasks to be carried out. Contrast, level of illumination, glare, etc., for example, in the use of computers, are of particular importance.

Infrared radiation can damage the retina or cause clouding of the lens; sometimes it can also affect the skin because of the heat given off.

Microwaves are particularly dangerous because of the health effects resulting from high heating capacity, as their action is enhanced when they affect water molecules that are part of the tissues.

Electromagnetic waves corresponding to Radio Frequency (RF) can also affect certain body tissues by heating.

3.2 Chemical Risks:

What is Chemical Risk?

Chemical risk' is a risk arising from contact (direct, handling, inhalation, etc.) with chemicals.

Royal Decree 374/2001, of 6 April, on the protection of the health and safety of workers against risks related to chemical agents at work, defines chemical agent as any chemical element or compound, on its own or mixed, as it occurs in its natural state or as it is produced, used or discharged during work activity.

From a practical point of view, in P.R.L. the chemical risk must be considered the potential toxicity of the product, concentration, exposure time and the individual characteristics of each person. Taking this into , the same chemical product can cause an Accident at Work for example, when splashes occur or when there is a sudden and highly concentrated emission of gases or vapours) or a potential Occupational Illness (for example, when a worker is exposed to a certain concentration of a chemical product in the environment he/she breathes for prolonged exposure times).

Chemical risk can therefore be associated with any activity involving the handling of chemicals (including suspended particulate matter, e.g. fibres (which can be highly toxic), dust, gases, vapours, etc.).

Chemical Agents and Health (prevention of PPH)

Inhalation of chemicals can cause intoxication, defined as 'a set of clinical signs and symptoms resulting from the action of a toxic product'. The degree of intoxication by a chemical agent depends on the following factors: toxicity of the product, concentration of the product in the environment, time of exposure and biological state of the individual (e.g. pregnancy or lactation, immunodeficiencies, etc.).

The toxic product has to pass a series of metabolic processes in the organism to be able to speak of intoxication **(ADAME** rule):

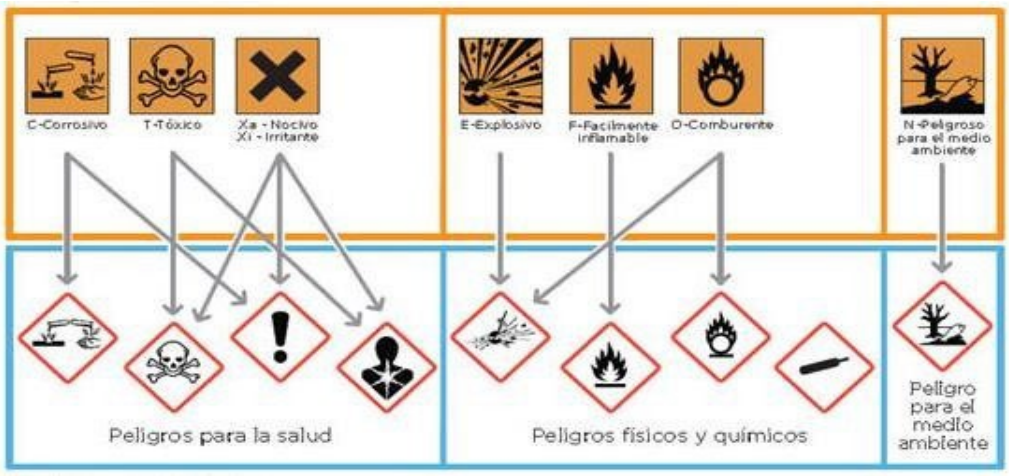
Absorption

Distribution (or transport)

Accumulation (or localisation)
Metabolisation (biotransformation)
Elimination
Direct detection of the chemical or its metabolites in blood or direct detection of the chemical or its metabolites in urine or exhaled air in the final elimination process of the chemical or its metabolites are the only procedures that can tell whether or not exposure to a toxicant has occurred. There are currently 46 products for which metabolites can be measured in biological samples of blood, urine and exhaled air. Periodically, the National Institute for Safety and Health at updates and publishes the occupational exposure limits for chemical agents in Spain.

Security marking and labelling
GLOBALLY HARMONISED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS).

The label is the basic and mandatory source of information that identifies the chemical and the hazards associated with its handling.
Each label must contain the following information:
Pictogram, maximum two.



➢ ***Señalización y Etiquetado de Seguridad***

SISTEMA GLOBAL ARMONIZADO (SGA)
CLASIFICACIÓN Y ETIQUETADO DE PRODUCTOS QUÍMICOS

El Sistema Global Armonizado busca suministrar información relacionada con los efectos que puedan ocasionarse por el USO de los productos químicos.

1.RIESGOS FISICOS

PICTOGRAMA	DEFINICIÓN
 6	Gases y aerosoloes inflamables; Líquidos y sólidos Pirofóricos
 4	Gases y Solidos Comburentes
 5	Explosivos
 7	Gases a Presión

2. RIESGO PARA LA SALUD

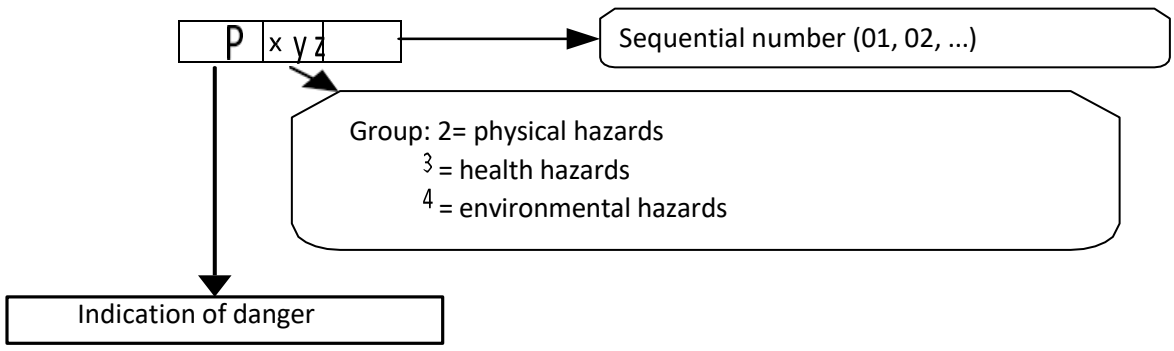
PICTOGRAMA	DEFINICIÓN
 1	Sensibilización respiratoria, Mutagenicidad en células germinales, Carcinogenicidad, Toxicidad para la reproducción, Toxicidad especifica de organos diana (Exposición unica y repetida) Peligro por aspiración
 3	Sensibilización Cutánea, Lesiones oculares Graves/Irritación Ocular, Irritación cutánea
 8	Sustancias y Mezclas Corrosivas
 9	Toxicidad Aguda por Ingestión, Inhalación Vía Cutánea

3.RIESGO PARA EL MEDIO AMBIENTE

SIMBOLO	DEFINICIÓN
 2	Toxicidad (Aguda y Crónica) Para el Medio Ambiente Acuático

HAZARD STATEMENTS: "H-PHRASES

Structure of hazard statements:



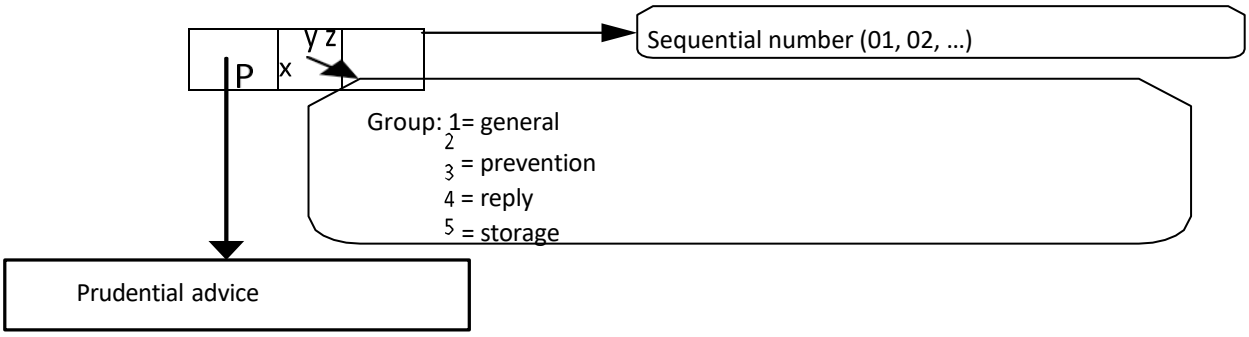
H200 - Indications of physical hazards	
H200	Unstable explosive.
H201	Explosive; danger of mass explosion.
H202	Explosive; serious danger of projection.
H203	Explosive; fire, blast or projection hazard.
H204	Danger of fire or projection.
H205	Danger of mass explosion in case of fire.
H220	Extremely flammable gas.
H221	Flammable gas.
H222	Extremely flammable aerosol.
H223	Flammable aerosol.
H224	Extremely flammable liquid and vapours.
H225	Highly flammable liquid and vapours.
H226	Flammable liquid and vapours.
H228	Flammable solid.
H240	Danger of explosion if heated.
H241	Danger of fire or explosion if heated.
H242	Danger of fire in case of overheating.
H250	It ignites spontaneously on contact with air.
H251	Heats up spontaneously; may ignite.
H252	Heats up spontaneously in large; may ignite.
H260	In contact with water it gives off flammable gases which may ignite spontaneously.
H261	In contact with water it gives off flammable gases.
H270	May cause or aggravate fire; oxidising.
H271	May cause fire or explosion; highly oxidising.
H272	May aggravate a fire; oxidiser.
H280	Contains pressurised gas; danger of explosion if heated.
H281	Contains refrigerated gas; may cause cryogenic burns or injury.
H290	May be corrosive to metals.
H300 - Indications of danger to human health	
H300	Fatal if swallowed.
H301	Toxic if swallowed.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters.
H310	Deadly in contact with skin.
H311	Toxic in contact with skin.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H317	May cause allergic reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H331	Toxic if inhaled.
H332	Harmful if inhaled
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May irritate the respiratory tract.

H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H351	Suspected of causing cancer.
H350i	May cause cancer by inhalation.
H360	May impair fertility or harm the foetus.
H360F	May impair fertility.
H360D	May harm the foetus.
H360Fd	May impair fertility. Suspected of damaging the foetus.
H360Df	May harm the foetus. Suspected of damaging fertility.
H360FD	May impair fertility. May harm the foetus.
H361	Suspected of impairing fertility or harming the foetus.
H361f	Suspected of impairing fertility.
H361d	Suspected of harming the foetus.
H361fd	Suspected of damaging fertility. Suspected of damaging the foetus.
H362	May harm breastfed infants.
H370	Causes organ damage.
H371	Can cause organ damage.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H400 - Hazard statements for the environment	
H400	Very toxic to aquatic organisms.
H410	Very toxic to aquatic organisms, with long lasting harmful effects.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic organisms, with long lasting harmful effects.
H413	May be harmful to aquatic organisms, with long lasting harmful effects.
H420	Causes damage to public health and the environment by destroying ozone in the upper atmosphere.
Supplementary hazard information (valid only in EU countries)	
Physical properties	
EUH001	Explosive in dry state.
EUH006	Explosive in contact or non-contact with air.
EUH014	Reacts violently with water.
EUH018	In use, explosive or flammable vapour-air mixtures may be formed.
EUH019	May form explosive peroxides.
EUH044	Risk of explosion when heated in a confined environment.
Properties related to health effects	
EUH029	In contact with water it releases toxic gases.
EUH031	Contact with acids liberates toxic gases.
EUH032	In contact with acids it releases highly toxic gases.
EUH066	Repeated exposure may cause dryness or cracking of the skin.
EUH070	Toxic in contact with eyes.
EUH071	Corrosive to the respiratory tract.
Properties related to environmental effects	
EUH059	Hazardous to the ozone layer.
Additional elements or information to be included on the labels of certain substances and mixtures	

EUH201	Contains lead. Do not use on objects that can be chewed or sucked by children.
EUH201A	Caution! Contains lead.
EUH202	Cyanoacrylate. Danger. Adheres to skin and eyes within seconds. Keep out of reach of children.
EUH203	Contains chromium (VI). May cause allergic reaction.
EUH204	Contains isocyanates. May cause allergic reaction.
EUH205	Contains epoxy components. May cause allergic reaction.
EUH206	Caution! Do not use together with other products. May release dangerous gases (chlorine).
EUH207	Caution! Contains cadmium. Hazardous vapours are released during use. See manufacturer's information. Follow safety instructions.
EUH208	Contains <name of sensitising substance>. May cause allergic reaction.
EUH209	It can easily become inflamed in use.
EUH209A	May swell in use.
EUH210	Safety data sheet available on request.
EUH401	In order to avoid risks to people and the environment, follow the instructions for use.

SAFETY TIPS: "P-PHRASES

Structure of the prudential advice:



P100 - GENERAL Prudential advice	
	If medical advice is needed, have the packaging or label at hand.
P102	Keep out of reach of children
P103	Read the label before use
P200 - Precautionary statements PREVENTION	
P201	Ask for special instructions before use
P202	Do not handle the substance before you have read and understood all of the safety instructions
P210	Keep away from heat, sparks, open flame or hot surfaces. - Do not smoke.
P211	Do not spray on an open flame or other ignition source.
P220	Keep or store away from clothing or combustible materials (the manufacturer or manufacturer's representative may use the incompatible materials shall be specified by the supplier).
P221	Take all necessary precautions not to mix with combustible materials (the manufacturer or supplier shall specify the materials incompatible).
P222	Do not allow to come into contact with air
P223	Keep away from any possible contact with water, as it reacts with water. violently and can cause a flare-up.
P230	Keep moistened with (materials to be specified by the manufacturer or supplier). incompatible).
P231	Handle in inert gas

P232	Protect from humidity
P233	Keep container tightly closed
P234	Keep only in the original container
P235	Keep in a cool place
P240	Grounding/equipotential bonding of the receptacle and the receiving equipment
P241	Use explosion-proof electrical, ventilation or lighting equipment (the other equipment shall be specified by the manufacturer or supplier).
P242	Use only non-sparking tools.
P243	Take precautionary measures against electrostatic discharges.
P244	Keep reduction valves clean of grease and oil.
P250	Avoid abrasion/shock/friction (manufacturer/supplier will specify what is required). which constitutes careless handling).
P251	vessel: do not pierce or burn, even after use.
P260	Do not breathe dust/fume/fume/gas/mist/mist/vapours/aerosol (the manufacturer or the supplier shall specify the applicable conditions).
P261	Avoid breathing dust/fume/fume/gas/mist/mist/vapours/aerosol (the manufacturer or the manufacturer's the supplier shall specify the applicable conditions).
P262	Avoid contact with eyes, skin or clothing.
P263	Avoid contact during pregnancy/breast-feeding
P264	Wash thoroughly after handling (manufacturer or supplier specify the parts of the body to be washed after handling).
P270	Do not eat, drink or smoke during use
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothes shall not be removed from the workplace.
P273	Avoid release to the environment (if not intended use).
P280	Wear protective gloves/protective clothing/goggles/face shields/mask (the manufacturer or supplier specify the type of equipment).
P281	Use mandatory personal protective equipment
P282	Wear cold insulating gloves/goggles/goggles/face shield.
P283	Wear flame retardant/fire retardant/flame resistant clothing.
P284	Wear respiratory protective equipment (the manufacturer or supplier shall specify the type of equipment to be worn). type of equipment).
P285	In case of inadequate ventilation, wear respiratory protective equipment (the manufacturer or supplier shall specify the type of equipment).
P231+P232	Handle in inert gas. Protect from moisture
P235+P410	Store in a cool place. Protect from sunlight
P300 - RESPONSE Prudential Advice	
P301	IN CASE OF INGESTION
P302	IN CASE OF SKIN CONTACT
P303	IN CASE OF CONTACT WITH SKIN (or hair)
P304	IN CASE OF INHALATION
P305	IN CASE OF CONTACT WITH EYES
P306	IN CASE OF CONTACT WITH CLOTHING
P307	IN CASE OF EXPOSURE
P308	IN CASE OF EXPOSURE OR SUSPECTED EXPOSURE
P309	IN CASE OF exposure or discomfort
P310	Immediately call a POISON CENTRE or doctor.
P311	Call a POISON CENTRE or doctor.
P312	Call a POISON CENTRE or doctor if you feel unwell.
P313	Consult a doctor
P314	Consult a doctor if you feel unwell.

P315	Consult a doctor immediately
P320	Specific treatment is urgently needed (see Reference to instructions from first aid in this label).
P321	Specific treatment is needed (see Reference to first aid instructions). (see the help notes on this label).
P322	Specific measures are needed (see Reference to first aid instructions in this label).
P330	Rinsing the mouth
P331	Do not induce vomiting
P332	In case of skin irritation:
P333	In case of skin irritation or rash:
P334	Immerse in cool water/apply wet compresses
P335	Shake off any particles deposited on the skin.
P336	Thaw frozen parts with lukewarm water. Do not rub the affected area
P337	If eye irritation persists:
P338	Remove contact lenses, if worn and easy to do. Continue rinsing.
P340	Transport the victim outside and keep him/her at rest in a comfortable position. to breathe.
P341	If breathing is difficult, transport the victim outside and keep him or her at rest on a comfortable breathing position.
P342	In case of respiratory symptoms:
P350	Wash gently with plenty of soap and water.
P351	Rinse thoroughly with water for several minutes
P352	Wash with plenty of soap and water
P353	Rinse skin with water/shower
P360	Immediately rinse contaminated clothing and skin with plenty of water before handling. taking off your clothes
P361	Remove contaminated clothing immediately
P362	Remove contaminated clothing and wash it before reuse.
P363	Wash contaminated garments before reuse.
P370	In case of fire:
P371	In the event of a major fire and in large quantities:
P372	Risk of explosion in case of fire
P373	DO NOT fight the fire when the fire reaches the explosives.
P374	Fight the fire from a reasonable distance, taking precautions. usual
P375	Fight the fire from a distance, given the risk of explosion.
P376	Stop the leak, if it is safe to do so.
P377	gas leak: Do not extinguish, unless the leak can be stopped safely.
P378	Use (the manufacturer or supplier shall specify the appropriate means, if water makes to increase the risk) to shut it down
P380	Evacuate the area.
P381	Eliminate all sources of ignition if it is safe to do so.
P390	Absorb the spillage so that it does not damage other materials.
P391	Collect the spillage
P301+P310	IF SWALLOWED: Immediately call an INFORMATION CENTRE. toxicology or to a doctor
P301+P312	IF SWALLOWED: Call a POISON CENTRE or a poison control centre. doctor if you are unwell
P301+P330+P331	IF SWALLOWED: rinse out. DO NOT induce vomiting
P302+P334	IN CASE OF SKIN CONTACT: Immerse in cool water/apply compresses. wet
P302+P350	IN CASE OF SKIN CONTACT: Wash gently with soap and water. abundant
P302+P352	IN CASE OF SKIN CONTACT: Wash with plenty of soap and water.
P303+P361+P353	IN CASE OF CONTACT WITH SKIN (or hair): Remove immediately. contaminated clothing. Rinse skin with water or shower.

P304+P340	IN CASE OF INHALATION: Remove victim to fresh air and keep at rest. in a comfortable breathing position
P304+P341	IN CASE OF INHALATION: If breathing is difficult, remove the victim to the outside and keep it at rest in a position that is comfortable for breathing
P305+P351+P338	IN CASE OF EYE CONTACT: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P306+P360	IN CASE OF CONTACT WITH CLOTHING: rinse immediately with plenty of water. contaminated clothing and skin before removing clothing.
P307+P311	IN CASE OF EXPOSURE: call a POISON CENTRE or a doctor
P308+P313	IN CASE OF EXPOSURE or SUSPECTED EXPOSURE: consult your doctor.
P309+P311	IN CASE OF EXPOSURE or if you feel unwell: call an INFORMATION CENTRE. toxicology or to a doctor
P332+P313	In case of skin irritation: consult a doctor.
P333+P313	In case of skin irritation or rash: consult a doctor.
P335+P334	Shake off any particles deposited on the skin. Immerse in water fresh/apply wet compresses
P337+P313	If eye irritation persists: consult a doctor.
P342+P311	In case of respiratory symptoms: call a POISON CENTRE or a doctor
P370+P376	In case of fire: stop the leak, if it is safe to do so.
P370+P378	In case of fire: Use (the manufacturer or supplier shall specify the means appropriate, if water increases the risk) to extinguish it.
P370+P380	In case of fire: Evacuate the area.
P370+P380+P375	In case of fire: Evacuate the area. Fight the fire from a distance, given the risk of explosion
P371+P380+P375	In case of major fire and in large : Evacuate the area. Fight against the fire at a distance, given the risk of explosion
P400 - Precautionary statements STORAGE	
P401	Store (in compliance with local, regional, national or international regulations) (please specify)).
P402	Store in a dry place
P403	Store in a well-ventilated area. (If the product is volatile and can generate a dangerous atmosphere).
P404	Store in a closed container
P405	Keeping under lock and key
P406	Store in a corrosion-resistant container (manufacturer or supplier). other compatible materials shall be specified) with resistant inner lining
P407	Leave a gap between loading blocks/pallets
P410	Protect from sunlight
P411	Store at temperatures not higher than (manufacturer or supplier) specify the temperature)
P412	Do not expose to temperatures exceeding 50ºC/122ºF.
P413	Store bulk quantities above (manufacturer or supplier shall specify mass) and at temperatures not exceeding (manufacturer or supplier shall specify mass) and at temperatures not exceeding (manufacturer or supplier shall specify mass) and at temperatures not exceeding (manufacturer or supplier shall specify mass) and at temperatures not exceeding (manufacturer or supplier shall specify mass). specify the temperature).
P420	Store away from other materials
P422	Store the contents in (the manufacturer or supplier shall specify the liquid or the appropriate inert gas).
P402+P404	Store in a dry place. Store in a closed container
P403+P233	Store in a well-ventilated place. Keep container closed (if the product is volatile and can generate a hazardous atmosphere).
P403+P235	Store in a well-ventilated place. Keep in a cool place.

P410+P403	Protect from . Store in a well-ventilated place.
P410+P412	Protect from . Do not expose to temperatures exceeding 50º C/122º F.
P411+P235	Store at temperatures not higher than (manufacturer or supplier) specify the temperature). Keep in a cool place.
P500 - ELIMINATION precautionary statements	
P501	Dispose of contents/container in (in accordance with local regulations), regional, national or international (please specify)).

Safety Data Sheets (SDS). These are documents that complement the information provided by labels and describe the characteristics of the different chemical substances, so that the "professional user" handling a chemical substance has information on the hazard associated with that substance.
In accordance with current legislation on the subject, it is compulsory that these are provided to the "professional user" with the first delivery of the product, or are available on the manufacturer's website. In addition to providing information on the nature, composition, etc. of the substances and their hazardousness, SDSs also provide information on other aspects such as: waste management, first aid, limit values and physico-chemical or toxicological data.

REMEMBER:

- These data sheets should be provided by the manufacturer or the distributor or should be available on their website.
- Before starting to use a chemical, the safety data sheet of the chemical must be read and the instructions given therein must be followed.

Handling of chemicals

Handling chemicals involves knowing how dangerous they are.

In general, and at the very least, the operations that may involve hazards are:

♦ Occasionally and exclusively in some institutes and/or laboratories they may be synthesised.
♦ Use of chemical substances or products in general
♦ Transfer
♦ Product storage
♦ Loading and unloading operations
♦ Transport
♦ Elimination

Any of these operations require consideration of the compatibility of products, on which their handling, transfer, storage, transport and even disposal will depend.

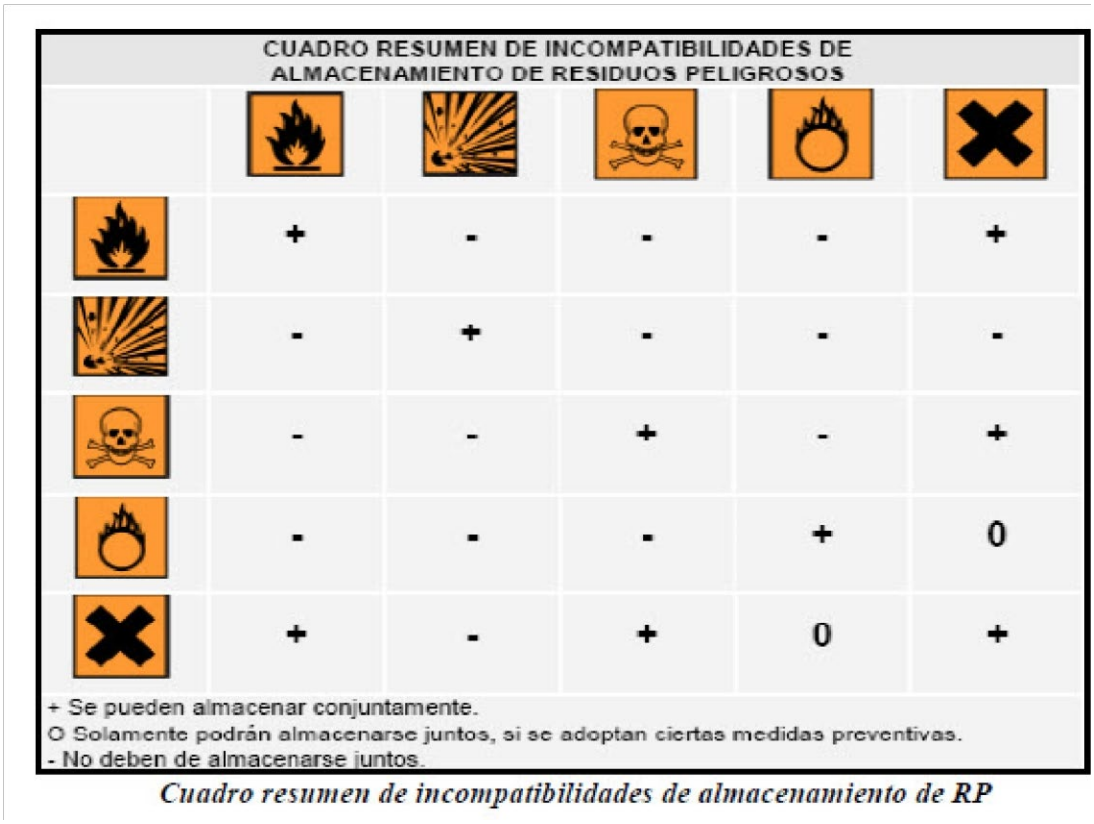
REMEMBER:

- Always use **Collective Protective Equipment** (fume hood and/or localised extraction). Whenever possible, **fume** should be used in all operations where highly toxic, carcinogenic, teratogenic, mutagenic, mutagenic, toxic for reproduction, toxic for the environment and/or allergenic substances are handled, or in operations that generate vapours or involve the handling of volatile substances.
- Always work with the **extraction and mechanical air renewal** systems **activated**.
- If the use of collective protection equipment is not sufficient, when certain operations must be carried out outside the fume hood or in the event of leaks or spills, localised extraction systems must be used and, if this is not sufficient, **Personal Protective Equipment (PPE)** appropriate to the operation being carried out and the products used must be used. **PPE is acquired and provided by the person in charge of the laboratory, research project, subject, etc. with the technical advice of the U.Le.'s own Prevention Service and the External Service (if applicable), in accordance with the regulations applicable in each circumstance.**

- Storage of products should take place in **specially areas**. Large quantities may be stored in communal areas intended for such use, while at all times trying to minimise the quantities of chemicals in the workplace.

Table of incompatibilities

When storing chemical substances or products and for any operation involving chemical substances or products, the table of chemical incompatibilities must be taken into account:



CUADRO RESUMEN DE INCOMPATIBILIDADES DE ALMACENAMIENTO DE RESIDUOS PELIGROSOS

	+	-	-	-	+
	-	+	-	-	-
	-	-	+	-	+
	-	-	-	+	0
	+	-	+	0	+

+ Se pueden almacenar conjuntamente.
O Solamente podrán almacenarse juntos, si se adoptan ciertas medidas preventivas.
- No deben de almacenarse juntos.

Cuadro resumen de incompatibilidades de almacenamiento de RP

:	E	O	F	T	C	N	TABLA DE INCOMPATIBILIDADES
E	SÍ	NO	NO	NO	NO	NO	E = Explosiva
O	NO	SÍ	NO	NO	NO	2	O = Comburentes
F	NO	NO	SÍ	NO	1	NO	F = Inflamables
T	NO	NO	NO	SÍ	SÍ	SÍ	T = Tóxicas
C	NO	NO	1	SÍ	SÍ	SÍ	C = Corrosivas
N	NO	2	SÍ	SÍ	SÍ	SÍ	N = Nocivas para el medio ambiente

1. Pueden almacenarse juntos si los envases son de seguridad
2. Pueden almacenarse juntos si se adoptan medidas especiales

Las letras que aparecen en la tabla corresponden a las que contienen los pictogramas de sustancias químicas en función de la peligrosidad asociada.

General Danger Sign

	• The work area must be **marked** if the products used are highly toxic. In this case the **general warning sign** and/or the sign corresponding to the activity being carried out (e.g. use of radioactive isotopes) shall be used.

Absorption and neutralisation procedures

The following table summarises some **chemical adsorption and neutralisation procedures** and families **chemicals**. In general, after consultation with the safety data sheet and in the absence of a specific method, it is recommended to an adsorbent or absorbent of proven effectiveness (activated carbon, vermiculite, aqueous or organic solutions, etc.) and then apply the recommended destruction or elimination procedure as waste. **Proceed to its direct neutralisation in those cases where there are guarantees of its effectiveness**, always assessing the possibility of generating toxic or flammable gases and vapours.

PRODUCTO O FAMILIA	PROCEDIMIENTO
Acetiluro de calcio	Recoger con vermiculita seca
Ácidos inorgánicos	Ver procedimiento general
Ácidos orgánicos	Bicarbonato sódico
Ácido fluorhídrico	Solución de hidróxido cálcico o de carbonato cálcico
Alcaloides	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Aldehídos	Solución de bisulfito sódico en exceso
Agua oxigenada	Vermiculita en gran exceso
Amiduros alcalinos	Cloruro amónico en exceso
Aminas alicíclicas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Aminas alifáticas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Aminas aromáticas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Anhídridos de ácidos orgánicos	Bicarbonato sódico
Azoderivados	Solución 10% de nitrato de cerio amoniacal
Bases inorgánicas	Ver procedimiento general
Bases pirimidínicas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Borohidruros	Agua fría en exceso
Bromuro de etidio	Carbón activo, Amberlita XAD-16 o Azul algodón (colorante)
Carbamatos	Solución de hidróxido sódico 5 M
Ceslo	Butanol o terbutanol en gran exceso

Cetonas	Solución de bisulfito sódico en exceso. Ver también procedimiento general de inflamables
Cianuros	Solución de hipoclorito sódico. Mantener siempre el pH básico
Clorometilsilanos	Agua fría en exceso
Compuestos orgánicos de azufre	Solución de hipoclorito sódico en gran exceso y agua jabonosa con hipoclorito sódico
Diisocianatos	Metanol frío
Etanolaminas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Fluoruros	Solución de cloruro cálcico
Formol	Solución de hipoclorito sódico
Fósforo blanco y fosfuros	Solución de sulfato de cobre y neutralización posterior con bicarbonato o hipoclorito sódico
Halogenuros inorgánicos	Bicarbonato sódico y solución de hidróxido sódico en exceso
Halogenuros de ácidos orgánicos	Bicarbonato sódico
Halogenuros orgánicos	Solución de hidróxido sódico 10%
Hidrazina (hidrato)	Solución de hipoclorito sódico
Hidrazinas substituidas	Solución de hipoclorito sódico, bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Hidroperóxidos	Vermiculita en gran exceso
Hidruros (en general)	Recoger con disolventes orgánicos. No emplear agua ni alcoholes
Ioduro de propidio	Carbón activo, Amberlita XAD-16 o Azul algodón (colorante)
Litio	Agua en gran exceso
Mercaptanos	Solución de hipoclorito sódico en gran exceso y agua jabonosa con hipoclorito sódico
Mercurio	Ver procedimiento específico
Metales pesados y derivados en solución	Formar derivados insolubles o recoger y precipitar a continuación
Metales carbonilados	Recoger con agua procurando que se mantenga el pH neutro
Organometálicos	Recoger con disolventes orgánicos. No emplear agua ni alcoholes
Perácidos	Vermiculita en gran exceso
Peranhídridos	Vermiculita en gran exceso
Perésteres	Vermiculita en gran exceso
Peróxidos	Vermiculita en gran exceso
Poliaminas	Bisulfato sódico, ácido sulfúrico diluido (pH=5-6) o ácido sulfámico
Potasio	Butanol o terbutanol en gran exceso
Rubidio	Butanol o terbutanol en gran exceso
Silano	Solución diluida de sulfato cúprico
Sodio	Metanol en gran exceso
Sulfato de dimetilo y dietilo	Solución de hidróxido sódico 5M
Sulfuros alcalinos	Solución de hipoclorito sódico en gran exceso y agua jabonosa con hipoclorito sódico
Sulfuro de carbono	Solución de hipoclorito sódico en gran exceso y agua jabonosa con hipoclorito sódico
Tetróxido de osmio	Solución de hidróxido amónico a pH 10
Tioéteres	Solución de hipoclorito sódico en gran exceso y agua jabonosa con hipoclorito sódico

Ejemplos de procedimientos de neutralización y absorción de vertidos de productos químicos

3.3 BIOLOGICAL HAZARDS

What is Biohazard?

For the purposes of Royal Decree 664/1997, following definitions apply:

a) Biological agents: micro-organisms, including genetically modified micro-organisms, cell cultures and human endoparasites, capable of causing any type of infection, allergy or toxicity.

b) Micro-organism: any microbiological entity, cellular or non-cellular, capable of reproduction or of transferring genetic material.

c) Cell culture: the result of in vitro growth of cells obtained from multicellular organisms. Taking into account the above, it is necessary at least to include: bacteria, viruses, parasites and fungi and to extend it to animal derivatives: hair, nails, fluids, etc.; plant derivatives: pollen, spores, etc., etc.

The use or handling of a biological agent may be the main purpose of the work, so two distinct situations must be considered:

- the **biological agent is intentionally handled** in the work activity**.**
- activities that **do not involve the deliberate intention to handle the biological agent, but the biological agent may be present.**

In general, there are certain work activities where it is necessary to consider possible exposure to biological agents:

1. Work in food production facilities.
2. Agricultural work.
3. Activities involving contact with animals/vegetables or products of animal/vegetable origin.
4. Health care work, including isolation and pathological anatomy services.
5. Work in clinical, veterinary, diagnostic and research laboratories, excluding microbiological diagnostic laboratories.
6. Work in waste disposal units.
7. Work on sewage treatment plants.

Biological Agents and Health

When contact with a particular biological agent produces undesirable effects on human health, it is referred to as **infection, allergy or toxicity**.

The classification that exists in Royal Decree 664/97, of 12 May, on the protection of workers against risks related to exposure to biological agents at work, allows an initial identification of micro-organisms according to their dangerousness. Four levels are established according to the following characteristics:

Article 3, RD 664/97. Classification of biological agents

For the purposes of Royal Decree, biological agents are classified into four groups according to the risk of infection:

- Group 1 biological agent: an agent unlikely to cause disease in humans.
- Group 2 biological agent: an agent that can cause disease in humans and may pose a hazard to workers, is unlikely to spread to the community, and effective prophylaxis or treatment is generally available.

- Group 3 biological agent: an agent that can cause serious disease in humans and presents a serious hazard to workers, with a risk of spreading to the community, and where effective prophylaxis or treatment is generally available.
- Group 4 biological agent: an agent that causes a serious disease in humans and poses a serious hazard to workers, with a high probability of spreading to the community and generally without effective prophylaxis or treatment.

Elimination and/or Reduction of Risks:

In the event that the assessment reveals a risk to the health of workers, exposure should be avoided or, if this is not possible, reduced to the lowest possible level. With this, a series of measures should be considered, including actions at the level of the source of contamination, at the level of the medium of diffusion, and finally at the level of the worker.

At the level of the **source of contamination**:

The source of contamination is understood to be both the biological agent involved and the task or process that may release it. Preventive measures at this level include the following:

- The replacement of biological agents which may pose a health hazard to the worker with others which are non-hazardous or less hazardous, where the nature of the activity permits.
- The establishment of work procedures and use of technical measures that prevent or minimise the release of biological agents in the workplace.
- The use of containment enclosures for processes generating bioaerosols or splashes.
- The collection, storage and disposal of biohazardous waste in standardised containers.
- Safe measures for the safe handling and transport of biological agents within the workplace.

At the **media** level**:**

If the release of the biological agent could not be prevented, measures must be taken to limit both its presence in the work area and its release to the external environment.

- Have working surfaces, floors and walls impermeable to water and resistant to disinfectants.
- Adequacy of the ventilation system.
- Establish programmes for vector control (insects, rodents).
- Develop appropriate cleaning and disinfection protocols.
- Provide eyewash and skin antiseptics in the facilities.
- Adequately signpost the biohazard.
- Have separate lockers for work clothes and street clothes. At worker level**:**
- Training and information appropriate to the potential risks involved.
- Precautions to be taken to prevent exposure to such risks.
- Hygiene provisions.
- Appropriate training and information on the use, cleaning and use of personal protective equipment (with special emphasis on how to put it on and, in particular, how to take it off after use).
- Measures to be taken in the event of an incident, for the prevention of accidents and in the event of leakage or accidental spillage.

This training must be given when the worker is to start work for the first time, when new risks appear and, if necessary, it must be repeated periodically. In addition, the laboratory manager is obliged to extend the information and training in particular cases, so that he/she is obliged to draw up written instructions indicating how to act in the following cases:

1. In the event of an accident or serious incident involving the handling of a biological agent.
2. In the event of handling a group 4 agent. The Occupational Risk Prevention Service of the U.Le. recommends drawing up Standard Work Procedures S.W.P.) for handling any type of biological agent, especially for those transmissible by inhalation.

Handling of biological agents

The establishment of adequate working procedures and the use of appropriate technical measures to avoid or minimise the formation of bioaerosols during the handling of samples is crucial to reduce possible exposure to biological agents.

REMEMBER:

Sampling must be carried out with extreme **caution** and using the appropriate **accessories** (needles, syringes, tubes, plates, racks, etc.) and **PPE** (gloves, mask, safety goggles, etc.). An **unknown sample** is a **potentially hazardous sample**. The use of gown and gloves is mandatory. The use of splash goggles or splash shields shall be required if there is potential exposure to splashes or splashes of body fluids.

Each sample shall always be transported in a **container with an adjustable lid and a seal** that prevents the potential leakage of fluids**.**

If during a **centrifugation operation** the tubes inside the equipment break, **wait at least 5 minutes** before opening the lid of the equipment. Subsequently, equipment, materials and work surfaces shall be disinfected with a product of proven effectiveness.

Single-use **syringes and needles shall be disposed of** in **special containers**.

It is important that all laboratories have **specific locations for the reception and initial handling of samples.** To this end, laboratories should have **biosafety cabinets** appropriate to the type of samples being handled. Such cabinets shall follow an appropriate maintenance programme involving the regular replacement of filters. There shall also be **protocols** describing how and where samples are to be handled.

ALSO REMEMBER:

In the case of **samples arriving from outside** the laboratory, the sender should be requested to send them in accordance with the relevant **safety standards**. Likewise, the **receipt** The use of these shall take into account the hazardous nature of the biological agents they contain.

With regard to the handling of samples, depending on the type of biological agent involved and the safety group to which it belongs, appropriate **containment barriers** shall be used **to prevent the dispersion of hazardous bioaerosols.**

4. PROTECTIVE EQUIPMENT IN THE LABORATORY

4.1. COLLECTIVE PROTECTION EQUIPMENT

Extractor hoods

Extractor hoods capture, contain and expel emissions generated by hazardous chemicals. They protect against spray and splash and facilitate the renewal of clean air. The purpose of fume hoods is to prevent the release of gases and/or vapours of pollutants in the laboratory. This is achieved by extracting these gases and/or vapours inside the fume hoods, preventing their expansion into

the laboratory environment, by passing these gases and/or vapours through a suitable filter (usually of activated carbon) and expelling the rest of the air to the outside.

The ability of the hood to provide adequate protection depends on the following controls:

-Speed control on the front of the hood.

-Air movement and flow path in the laboratory (directly related to the location of the hood in the laboratory).

-Effect of operator presence on the flow path at the front of the hood.

-Disturbances inside the hood (also related to the location of the hood in the laboratory, movement of personnel in front of the hood, accessories inside the hood, etc.).

Recommendations for the use of extractor hoods:

•Fume hoods must be checked regularly according to the manufacturer's/installer's instructions and their filters must also be renewed at regular intervals.

•Always work at least 15 cm away from the hood frame.

-Reactor vents should be directed towards the inner wall and, if possible, towards the hood ceiling.

-The hood must not be used for storing chemicals. The work surface must be kept clean and clear.

-Caution should be exercised in situations that require lowering the sash window achieve a minimally acceptable frontal velocity.

-Extractor hoods must always be in good working condition. The operator should not detect strong odours coming from the material inside. If they are detected, make sure that the extractor is in operation.

Biological Safety Cabinets (BSC)

They are designed to provide personal, environmental and product (sterilisation) protection when proper practices and procedures are followed.

They use high efficiency filters to remove particles from the air at the air outlet and/or air inlet. **Not to be confused with other laminar flow devices**, such as culture cabinets where the air is generally blown from the inside of the cabinet to the outside (and como into direct contact with the cabinet operator or user), these culture cabinets **should** never be **used** to handle infectious, toxic or sensitising materials.

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Types of BSCs

Class I: Ventilated cabin for personal protection with air intake from the operator. The air discharged to the outside passes through a high efficiency particulate filter (HEPA filter) to protect the environment from discharges of pathogenic agents. It is suitable for working with moderate risk agents, when containment is required but **NOT** for product protection (sterilisation).

Class II: Ventilated cabin for the protection of personnel, the product and environment. It has high efficiency particle filters at the inlet and outlet. They are used with agents that produce low to moderate risks, sometimes with very small quantities of toxic chemical substances. In turn, there are two types of class II cabinets: class II A and class II B; they are differentiated according to the percentage of air they recirculate.

Class III: Fully enclosed, leak-proof cabin maintained at less than atmospheric pressure. It has a high efficiency particle filter at the gas inlet and two, in series, at the outlet. Access to the interior is through the use of rubber gloves attached to the cabin itself.

Recommendations for the use of CSBs

-Generally, similar to those established for extractor hoods; they must be checked periodically according to the manufacturer's/installer's instructions and their filters must also be renewed at established intervals.

-Before use, the work surface should be washed with 70% alcohol or other disinfectant suitable for the agent to be used. Wash all necessary utensils before placing them in the CBS.

•**NO** objects should be placed in front of the air inlet. air outlet must **NOT** be blocked.

-Clean and contaminated utensils should be separated, with the latter placed further away from the operator and the clean utensils closer.

•It is advisable to place a tray or similar inside for the collection of sharps, used pipettes, etc. No used material should be disposed of outside the CBS.

-Spills in the CBS must be cleaned up immediately. Wait 10 min. from the end of cleaning before continuing work and keeping the cabin in operation.

-When the work is completed, all material is collected and all interior surfaces are washed with 70% alcohol or any other disinfectant suitable for the agent used.

-Before leaving the laboratory, remove gown, gloves and any other personal protective equipment and wash hands thoroughly.

4.2. SELECTION AND USE OF PPE

What is a PPE?

Royal Decree 773/1997 1997of 30 May , establishing the minimum health and safety provisions relating to the use by workers of personal protective equipment, defines Personal Protective Equipment (PPE) as “any equipment intended to be worn or held by the worker to protect him from one or more risks”, which may threaten his safety or health at work, as well as any complement or accessory intended for this purpose.

What must PPE comply with?

The conditions for the marketing and essential health and safety requirements of PPE were established in Royal Decree 1047/1992 (and its modifications) which regulates the marketing and

free inter-community circulation of personal protective equipment. It makes it compulsory for all PPE prototypes to be subjected to "**EC"** testing by an officially recognised Control Body, which guarantees the effectiveness of the equipment in accordance with the standards in force.

Particularly noteworthy is the obligation on the part of the manufacturer to supply an information leaflet with each piece of equipment, a document of great use in the process of selection and use, and which must contain information about all its characteristics, for example, instructions and limitations of use, maintenance, cleaning, revisions, expiry date, etc. It must be written in the language of the worker and its content must be perfectly clear.

The minimum requirements for the choice and use of PPE are laid down in Royal Decree 773/1997.

How should PPE be chosen?

The need for personal protective equipment in the laboratory arises when there is an accidental leak, spill or sudden exposure, or when the existing safety systems are inadequate.

collective protection are insufficient to guarantee adequate protection of the users present in the laboratory (either because of the existence of residual risks or because it is impossible to use such collective protection systems). To this end, a risk assessment must be carried out for the laboratory as a whole, specifically studying the different agents (physical, chemical and/or biological) used, their handling, the instruments used, the technology applied and all the activities and operations carried out, assessing all the aspects of these that may constitute risk factors.

The use of PPE or a combination of PPE against one or more hazards may entail a number of inconveniences. Therefore, when choosing appropriate PPE, not only the level of safety required but also comfort must be taken into account, and laboratory workers or their representatives (Prevention Delegates) must be consulted

Use and maintenance

For the correct use of the PPE purchased and prior to their use, a standard operating procedure must be drawn up and the existing procedure on the acquisition, maintenance and management of PPE (see the U.Le. website) must be implemented and completed, clearly and concretely covering the following aspects:

- ✓ Areas or type of operations in which it is to be used
- ✓ Instructions on correct use
- ✓ Limitations on use, if any
- ✓ Storage, cleaning and care instructions
- ✓ Expiry date or expiry date of the PPE or its components

A personal protective equipment management programme should be implemented in the laboratory, including, but not limited to, the following aspects:

1. Maintenance of minimum storage of all PPE.
2. To provide adequate training and information on PPE to all laboratory personnel. To this end, training and information activities will be carried out in which the different equipment available, both for personalised use and not, as well as their compulsory use, recommendations and maintenance, will be made known.
3. All laboratory personnel should be familiar with and have a written document indicating the number and type of equipment available in the laboratory, in addition to that already provided in person, the situations and operations in which its use is mandatory, the conditions of use and maintenance, the place of storage.

4. Equipment must be delivered with acknowledgement of receipt, accompanied by written instructions for use where deemed necessary.

The table below describes some of the most frequent operations and activities carried out in a laboratory and the risks associated with them.

Tabla 1: Actividades más frecuentes y riesgos asociados (NPT 518)

Operaciones/actividades	Riesgos 1	EPI utilizables
Manipulación de: ➢ ***Disolventes y productos volátiles*** ➢ ***Aparatos a temperaturas elevadas*** ➢ ***Jeringas, material de vidrio y columnas capilares*** ➢ ***Botellas a presión*** ➢ ***Extracciones en frío y en caliente*** ➢ ***Operaciones con vacío***	➢ Inhalación de vapores orgánicos ➢ Irritación de la piel y vías respiratorias ➢ Salpicaduras y proyecciones ➢ Quemaduras ➢ Incendios ➢ Cortes y pinchazos ➢ Contaminación biológica	➢ Gafas ➢ Guantes ➢ Mascarillas ➢ Pantallas faciales
Manipulación 2 de: ➢ ***Material biológico*** ➢ ***Fluidos biológicos*** ➢ ***Animales de experimentación***	➢ Cortes y pinchazos ➢ Arañazos y mordeduras ➢ Inhalación de un bioaerosol ➢ Contacto dérmico	➢ Guantes ➢ Mascarillas ➢ Pantallas faciales
➢ ***Manipulación de productos con riesgos específicos***	➢ Exposición a cancerígenos, mutágenos y tóxicos para la reproducción ➢ Exposición a radionucleidos 3 ➢ Exposición a fibras de amianto y otras	➢ Gafas ➢ Guantes impermeables a fluidos biológicos ➢ Guantes resistentes a cortes y punciones ➢ Mascarillas ➢ Pantallas faciales
➢ ***Almacén y trasvases***	➢ Incendios ➢ Vertidos ➢ Salpicaduras	➢ Equipo autónomo o semiautónomo 4 ➢ Gafas ➢ Guantes ➢ Delantal ➢ Mascarilla

1. El estudio de los riesgos asociados a las diferentes operaciones y manipulación de productos que se realizan en el laboratorio permite la elección de los EPI necesarios, su utilización, distribución y mantenimiento.
2. En este caso no debe confundirse la protección del material, normalmente por cuestiones de esterilidad, de la del trabajador.
3. Deben estar sujetos a los requerimientos normativos específicos.
4. Puede considerarse su uso de manera general en el laboratorio para situaciones de emergencia o autosalvamento.

4.3. MOST COMMON TYPES OF EPI USED IN THE LABORATORY

The following describes some practical advice and criteria for the PPE that may be most frequently required in university laboratories. Other PPE normally used in laboratories where there may be other hazards (e.g. electrical) that may require the use of certain types of gloves, insulating bench, pole, helmets, etc. have not been considered.

Protective gloves

The **purpose** of this equipment is to prevent contact and penetration of biological agents and/or toxic, corrosive or irritant substances through the skin, especially through the hands, which is the part of the body most likely to come into contact with chemical or biological products. The risk of impregnation of clothing, which can be prevented by using aprons and aprons (considered PPE), should not be underestimated; it should be remembered that work clothes (smocks, uniforms, pyjamas) are NOT PPE and that in certain tasks other personal protective equipment is more appropriate to the hazardous characteristics of the chemical or biological agent being handled. In case of direct contact with a chemical substance, product or biological agent, wash the protection and/or work clothes immediately.

Relevant practical instructions for use:

- The skin itself is a good protection against external aggressions. Therefore, special attention should be paid to proper hand hygiene with soap and water or antiseptics. In addition, special attention should be paid to areas of skin that may be damaged or deteriorated (cuts, punctures, scratches, etc.); some operations are strictly forbidden in case of skin wounds.

- When choosing protective gloves, it is important to consider the sensitivity to touch and grip on the one hand, and the highest possible need for protection on the other hand. *The manufacturer's information leaflet* should be taken into account. This information leaflet contains useful information on: storage, use, cleaning, maintenance, disinfection, accessories, spare parts, protection classes, expiry date/time, explanation of brands, etc.

- Protective gloves must be the correct size. Gloves that are too tight can, for example, impair their insulating properties or hinder circulation, and gloves that are too large will make it difficult to feel and grip objects properly.

- Safety gloves are manufactured in different materials (PVC, PVA, nitrile, latex, neoprene, etc.) depending on the risk to be protected. For use in the laboratory, in addition to the necessary mechanical resistance to traction and perforation, it is essential that they are waterproof against different chemical products, adequate protection against possible biological risks, risk of burns, cold or freezing, electricity, etc. For these reasons, when choosing a safety glove, it is necessary to know its suitability, depending on the potential risks it has to protect (for this purpose, it is necessary to have the corresponding certificate, which must be provided by the supplier). Table 2 shows, by way of example, some types of gloves and their chemical resistance.

Tabla 2. Resistencia química de guantes

COMPUESTO QUÍMICO	COMPOSICIÓN DE LOS GUANTES					
	Caucho natural o látex	Neopreno	Buna-a (nitrilo)	Butilo	PVC	PVA
ÁCIDOS INORGÁNICOS						
Ácido crómico	M	R	R	B	B	M
Ácido clorhídrico 38%	B	E	B	B	E	M
Ácido fluorhídrico 48%	B	E	B	B	B	M
Ácido fosfórico	B	E	B	B	B	M
Ácido nítrico 70%	M	B	I	B	R	M
Ácido nítrico fumante (Humos rojos)	NC	I	I	NC	I	M
Ácido nítrico fumante (Humos amarillo	NC	I	I	NC	I	M
Ácido sulfúrico 95%	E	E	R	B	R	M
ÁCIDOS ORGÁNICOS						
Ácido acético	E	E	B	B	B	M
Ácido fórmico	**E**	**E**	**R**	**B**	**E**	I
ALCOHOLES						
Alcohol butílico	E	E	B	B	B	R
Alcohol etílico	E	E	B	B	B	R
Alcohol metílico	E	E	B	B	B	R
ALDEHIDOS						
Acetaldehído	B	E	B	B	B	R
Benzaldehído	R	R	R	B	R	B
Formaldehído	E	E	B	B	B	I
CAÚSTICOS						
Hidróxido de amonio	E	E	B	B	E	M
Hidróxido de sodio 50%	**E**	**E**	**B**	**B**	**B**	M
AMINAS						
Anilina	R	R	B	B	B	R
Dietilamina	R	B	E	NC	R	R
Hidracina	B	R	B	NC	B	M
DISOLVENTES AROMÁTICOS						
Benzol	M	I	B	NC	I	E
Destilados de alquitrán de hulla	M	R	B	NC	R	E
Estireno	M	R	B	NC	I	E
Tolueno	M	M	E	M	B	E
Xileno	M	I	B	R	M	E
DISOLVENTES ACETONAS						
Acetona	E	B	I	B	I	R
Metil etil etona	E	B	R	B	M	E
Metil isobutil cetona	E	B	R	B	R	B

Tabla 2. Resistencia química de guantes (continuación)

COMPUESTO QUÍMICO	COMPOSICIÓN DE LOS GUANTES					
	Caucho natural o látex	Neopreno	Buna-a (nitrilo	Butilo	PVC	PVA
DISOLVENTES CLORADOS						
Cloroformo	M	B	B	R	M	E
Cloruro de metilo	R	B	B	NC	M	E
Percloro etileno	M	M	B	M	M	E
Tetracloruro de crbono	M	R	B	M	R	E
Tricloroetileno t.c.e.	M	B	B	NC	M	E
DISOLVENTES DERIVADOS DEL PETROLEO						
Hexano	M	R	E	NC	R	E
Keroseno	M	B	E	M	R	E
Pentano	R	B	E	M	M	E
DISOLVENTER VARIOS						
Acetato de etilo	I	B	B	B	M	I
Acetato de propilo	B	B	B	B	I	B
Acrilonitrilo	B	B	R	B	I	E
Bromuro de metilo	R	B	B	NC	M	E
Disolventes de pintura	**R**	**B**	**B**	**NC**	**R**	E
OTROS PRODUCTOS						
Aceite de corte	I	E	B	M	B	R
Baños electrolíticos	E	E	B	I	E	M
Barniz para madera (tung oil)	M	B	B	NC	R	E
Decapantes para pintura y barnices	R	B	B	NC	M	B
Diisocianato de tolueno	B	R	B	NC	M	B
Disulfuro de carbono	M	R	B	M	R	E
Etilenoglicol	E	E	B	B	B	B
Glicerina	E	B	B	B	E	R
Grasas animales	E	B	B	NC	B	E
Peróxido de hidrógeno 50% (agua oxig	B	B	B	B	R	I
Resinas de époxi	E	E	B	B	E	E
Tintas de imprimir	B	E	E	NC	I	E
Trinitrotolueno	B	B	B	B	E	E
Trementina	M	B	E	M	B	

E= excelente B= bueno R= regular I=inferior M= malo NC= no comprobad

Face and eye protection

In the laboratory, chemical splashes and impact of objects on the face or eyes of either the direct user or third parties may occur. For this reason face and eye protection should be considered as very important and should be worn at all times in the laboratory.

Tabla 3. Actividades en laboratorio que requieren protección ocular

ACTIVIDADES	OPERACIONES
➢ Material de vidrio a presión reducida ➢ Materiales criogénicos ➢ Material de vidrio a presión elevada ➢ explosivos ➢ Sustancias cáusticas, irritantes o corrosivas ➢ Sustancias biológicas con riesgos para la salud ➢ Materiales radiactivos ➢ Luz ultravioleta ➢ Sustancias químicas tóxicas ➢ Sustancias carcinogénicas ➢ Materiales inflamables ➢ Luz láser	➢ Fusión ➢ Taladrado ➢ Lijado/Triturado ➢ Serrado

The existing guards are divided into two main groups depending on the protected area: If the protector only protects the eyes, it is referred to as **goggles**.

If, in addition to the eyes, the protector protects part or all of the face or other areas of the head, it is referred to as a **shield**.

Choice, use and maintenance:

1. When choosing eye and/or face shields, it is advisable to take the *manufacturer's information leaflet* into account. This information leaflet contains all useful data concerning: storage, use, cleaning, maintenance, disinfection, accessories, spare parts, protection classes, expiry date/term, explanation of brand names, etc.

2. The choice of eye protectors must be made according to the potential risk from which the user must be protected (I.R. radiation; U.V. radiation; welding; chemical splashes; biological splashes; material particles (e.g. when cutting with a radial saw), etc.). In the particular case of laser radiation, it is preferable, given the complexity of the choice, to use a supplier of proven reliability in this field.

3. The lack or deterioration of visibility through eyepieces, visors, etc. is a source of risk in most cases. For this reason, it is essential to ensure that this condition is met. To achieve this, these elements must be cleaned on a daily basis in accordance with the manufacturer's/distributor's instructions.

4. In order to prevent skin diseases, protectors must be disinfected periodically and in particular whenever the user changes, also following the indications given by the manufacturers so that the treatment does not affect the characteristics and performance of the various elements.

5. Before using the guards, they should be visually inspected to ensure that they are in good condition. If there are any damaged or deteriorated elements, they should be replaced and, if this is not possible, the entire equipment should be put out of use.

Indicators of deterioration can be: yellowing of the eyepieces, surface scratches on the eyepieces, tears, etc.

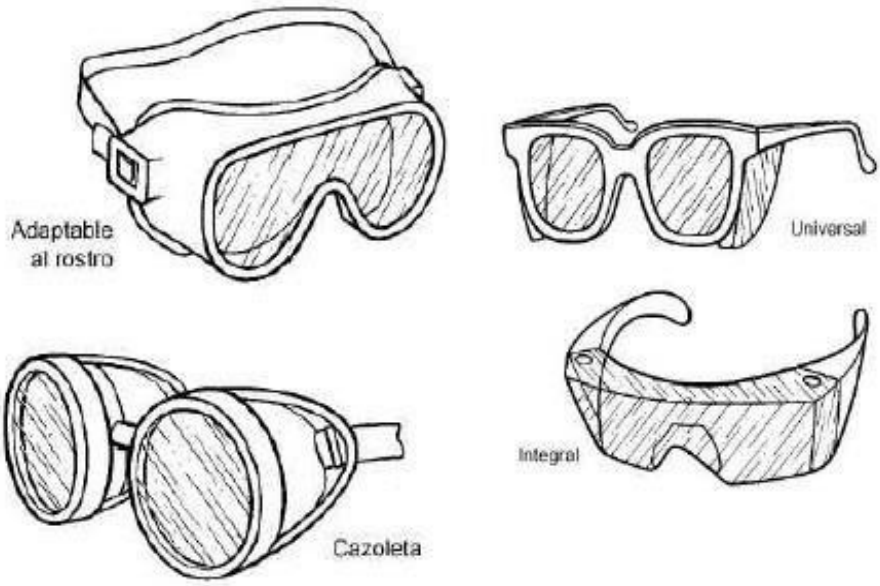
6. To ensure good preservation, equipment shall be stored, when not in use, clean and dry in their cases. If they are removed for brief periods, care shall be taken not to leave them with the eyepieces facing downwards, in order to avoid scratches.

Glasses

Protective goggles must offer good frontal and side protection. Considering the type of frame they can be grouped into:

1. Universal type spectacles. Eyepieces are attached to a frame with temples (with or without side shields).
2. Glasses of the cup or bowl type. Encloses each eye separately.
3. Glasses adaptable to the face. With a single eyepiece.
4. Full-face spectacles. They enclose the orbital region tightly and in contact with the face.

They can be used in conjunction with prescription glasses, which is why they are often referred to as "spectacle covers".



Screens

The following types of protective screens can be distinguished:

1. *Face shield*. An eye shield covering all or part of the face.
2. *Hand-held screens*. These are facial screens that are held in the hand.
3. *Full face shield*. These are eye protectors which, in addition to the eyes, cover the face, throat and neck, and can be worn on the head either directly by means of a head harness or with a protective helmet.
4. *Mounted face shield*. This term is coined when considering that eye protectors with face shields can be worn directly on the head by means of a head harness, or in conjunction with a protective helmet.

Corrective lenses and contact lenses.

People whose vision requires the use of **corrective lenses** should use one of the following types:

-Safety goggles with prescription safety lenses.

-Eye protection spectacles which can be worn over prescription spectacles without disturbing the fit of the spectacles.

Notwithstanding the above, current legislation on the subject does NOT oblige the company to supply prescription safety glasses, the most commonly used option being the use of a "goggle cover" or screen.

Persons who need to wear **contact lenses** during laboratory work should be aware of the following potential hazards:

-It will be virtually impossible to remove contact lenses from the eyes after a chemical has been spilled in the eye area.

-Contact lenses will interfere with emergency washing procedures.

-Contact lenses can trap and collect fumes and solid materials in the eye.

-If chemicals enter the eye and the person becomes unconscious, emergency personnel will not be aware that the person is wearing contact lenses. Therefore, the use of contact lenses in the laboratory should be considered (in, the use of contact lenses is discouraged in all operations involving potential splash hazards).

Respiratory protection

Personal protective equipment for the respiratory tract is equipment that aims to prevent the contaminant from entering the body through the respiratory tract. Technically, they can be classified into environmentally **dependent and environmentally independent equipment.**

Recommendations

-When choosing respiratory protective equipment, it is advisable to take *the manufacturer's information leaflet* into account. This information leaflet contains all useful data: storage, use, cleaning, maintenance, disinfection, accessories, spare parts, protection classes, expiry date/term, explanation of brand names, etc. The following factors should be considered in the choice of equipment:

-Technical aspect: equipment must be chosen that is appropriate to the potential risks involved.

-Ergonomic aspect: among the equipment that satisfies the technical aspect, the one that best suits the user's personal characteristics should be chosen. The user or his representatives must be involved in this decision. The most important characteristics of the equipment in this respect are:

1. Reduced visual and/or hearing impairment.
2. Lowest possible weight.
3. Head harness with comfortable adjustment system for normal working conditions.
4. The parts of the facepiece that are in contact with the user's face shall be made of soft material.
5. The material of the face adapter must not cause skin irritation.
6. Correctly fitting, small filter (preferably one that minimally reduces the field of view).
7. The equipment should make it as easy as possible for the user to breathe.
8. Pleasant odour or, better still, odourless.

1. Environmentally dependent equipment

They are devices that use the ambient air and purify it, i.e. retain or transform the pollutants present in the air to make it breathable. They cannot be used when the air is deficient in oxygen, when pollutant concentrations are very high or when highly toxic substances are involved or when there is a danger of not detecting their malfunction.

They have two clearly differentiated parts: ***the face adapter and the filter.***

The task of **the facepiece** is to create a hermetically sealed space around the airways so that the only access to the airways is through the filter. There are three types: *mask, mask and mouthpiece*.

Máscara

Mascarilla

Boquilla

Filters have the task of purifying the air and removing pollution. They are classified into three main groups: *against particles and aerosols, against gases and vapours and against particles, gases and vapours.*

Against particles and aerosols

The filtering material is made up of a mesh of plastic fibres which retains the pollutant to a greater or lesser extent. These are type P filters and are classified, according to their filtering efficiency, into three classes:

- **P-1**: Low-efficiency filters
- **P-2**: Medium efficiency filters
- **P-3**: High efficiency filters

Against gases and vapours

The filtering material is activated carbon which is subjected to different treatments depending on the pollutant to be retained. We have the following types of filters:

- **A** Against organic gases and vapours with O.P.> 65 ºC
- **AX** Against organic gases and vapours with O.P.< 65 ºC
- **B** Against inorganic gases and vapours
- **E** Against sulphur dioxide and acid vapours
- **K** Against ammonia and organic ammonia derivatives
- **SX** Against specific gases and vapours

There are also multiple gas and vapour filters, which are a combination of two or more of the above filters, excluding type SX filters, and which meet the requirements of each type separately. All these types of filters, excluding AX and SX types, are classified according to their capacity into three classes:

-Class **1**: Low-capacity filters

-Class **2**: Medium capacity filters

-Class **3**: High capacity filters

For example, if a mask is designed to be used with two filters, both filters must be identical.

Against particles, gases and vapours

They are called combined. The filtering part is the sum of the two previous cases. Special filters belong to this group:

-Type **NO-P3**: Against nitrogen oxides

-Type **Hg-P3**: against mercury

Table 4. Type, class, colour and particularities

TIPO	CLASE	COLOR	PARTICULARIDADES
A	1,2 ó 3	Marrón	- - -
AX	- - -	Marrón	No reutilizable
B	1,2 ó 3	Gris	- - -
E	1,2 ó 3	Amarillo	- - -
K	1,2 ó 3	Verde	- - -
P	1,2 ó 3	Blanco	- - -
SX	- - -	Violeta	Debe figurar el nombre de los productos químicos y sus concentraciones máximas frente a los que el filtro ofrece protección.
NO-P3	- - -	Azul Blanco	No reutilizable
Hg-P3	- - -	Rojo Blanco	Duración máxima 50 horas

Marking All filters must bear at least the following specifications on their marking:

-Identification of the manufacturer, supplier or importer.

-The number and date of the standard.

-The CE marking accompanied by the number of the Notified Body which has carried out the last production quality control.

-Type, class, colour code and particularities according to table 4.

-The phrase "see manufacturer's information".

-Year and month of expiry.

-Storage conditions.

-For combination filters, the direction of airflow within the filter, whenever there is any doubt about the coupling of the filter.

Self-filtering respirator

This is a special type of respiratory protector which combines the facepiece and filter in one inseparable body. They are not suitable for protection against gases or vapours but are more suitable for protection against solid particles and aerosols.

2. Environmentally independent equipment

This equipment is characterised by the fact that the air breathed by the user is not that of the working environment and is classified as: ***semi-autonomous and autonomous***.

• **Semi-autonomous equipment** uses air from a different environment, uncontaminated and transported through a duct or from non-portable pressure vessels.

• **Self-contained units** are those in which the air supply system is carried by the user. Their use is indicated in cases where the air is unbreathable and autonomy and freedom of movement are required.

PPE against biological risk

Equipment for biohazard protection deserves special mention. The following considerations should be made in this respect:

-There is a strong tendency to confuse equipment intended to prevent contamination of sterile material (product protection) with equipment intended for worker protection. Where there is a biological risk, a protocol for the use of PPE must be established that

The use of a sample of material or specimen shall correspond to an effective protection against it, combined, where appropriate, with that of maintaining the asepsis of the material or specimen.

-As far as skin protection is concerned, the *manufacturer's information leaflet* should be taken into account. This information leaflet contains all useful data concerning: storage, use, cleaning, maintenance, disinfection, accessories, spare parts, protection classes, expiry date/term, explanation of brand names, etc. Depending on the relative size of the biological agent and the pores of the gloves used, it may sometimes be necessary to use 2 or even 3 pairs of gloves on top of each other. When there is a risk of splashing, face shields should be used.

Respiratory protection against inhalation of bioaerosols would involve the use of respiratory protective equipment with HEPA (High Efficiency Particulate Airborne) filters capable of retaining micro-organisms and thus sterilising the air inhaled through them. Sometimes P3 filters may also be recommended.

Finally, it should be noted that training is very important in this case, with special emphasis on the correct adaptation of PPE prior to use and the correct way to remove PPE after use.

Noise protection

Hearing protectors are items of personal protection used to reduce the noise perceived by a person in a noisy environment. In general, it is advisable to wear hearing protection when the equivalent daily dB(A)-weighted noise level exceeds 80.

Areas with excessive noise should be signposted, indicating that noise protection is required. Acoustic shields should be available.

These types of noise protection include:

Plugs

Headphones or earphones

Foot protection

Foot protection is designed to prevent injuries from corrosive substances, falling or stepped on heavy objects, electric shock and to prevent slipping on wet floors. Cloth shoes, such as tennis shoes, readily absorb liquids. If a chemical is spilled on a fabric shoe, it should be removed immediately. It is recommended to wear shoes that completely cover and protect the feet. not wear sandals, clogs, high heels or shoes that leave the foot uncovered in the laboratory. There is a wide variety of laboratory shoes available today.

5. WORK CLOTHING

Work clothing is NOT Personal Protective Equipment, however all work clothing must meet certain minimum criteria depending on the expectations placed on it (gowns, uniforms, "pyjamas", etc.). The most commonly used work clothes in laboratories are ***lab coats, some aprons*** **and in other typical university departments,** ***"pyjamas" for operating theatres,*** **etc.**

Lab Coat

It is designed to protect clothing and skin from chemicals that may spill or splash. It should always be worn buttoned and should cover up to the knee. There are different types of gowns that provide different protection:

- **Cotton**: protects against "flying" objects, sharp or rough corners and is a good fire retardant.
- **Wool**: protects from splashes or crushed materials, small amounts of acid and small flames.
- **Synthetic fibres**: Protects against sparks, IR or UV radiation. However, lab coats made of synthetic fibres may amplify the adverse effects of some laboratory hazards. In addition, some synthetic fibres melt on contact with flame. This molten material can cause blistering and skin burns and emit irritating fumes.
- **Aluminised and refractory fabric**: protects against heat radiation.

Aprons

The apron provides an alternative to the lab coat. It is usually made of plastic or rubber to protect against corrosive and irritating chemicals. An apron should be worn over clothing that covers the arms and body. There are certain aprons which are considered IPE (e.g. those used in welding operations, for protection against ionising radiation, etc.); for the latter, the regulations stipulated for IPE would apply.

6. EQUIPMENT FOR EMERGENCY USE

What are they?

They are aids to be used in case of emergencies (spills, splashes, spills, leaks, etc.). They must be kept in good condition and within reach (i.e. they must not be hidden by panels, clothing, etc.) so that they can be used as quickly as required, and in any case they must be properly marked.

Most common laboratory equipment for emergency use

Laboratories usually have a number of emergency response elements. The most common ones are described below (they must always be correctly marked).

-Eye Wash

-Safety showers

Fire safety equipment:

- Switchboards
- Alarm buttons
- Sirens
- Fire extinguishers
- Equipped Fire Hydrants (Fire Hoses)
- Fire hydrants
- Sprinklers
- Flame retardant blankets
- Sand or specific fire extinguishing material

Equipment signalling

Eyewash

It is a system that must allow rapid and effective decontamination of the eyes and is basically made up of two sprayers or nozzles capable of providing a jet of drinking water for washing the eyes or face, a basin with a corresponding drain, a system for fixing to the floor or wall and a foot or elbow actuator. The jet provided by the nozzles should be of low pressure so as not to cause unnecessary pain or injury. Water should be potable and warm water is recommended. Eyewash facilities should be easily accessible and clearly marked and should be within easy reach of the laboratory workstations, so that the casualty is able to

reach it with their eyes closed (eye injuries are often accompanied by temporary blindness). In addition, they should be close to safety showers (eye injuries are often accompanied by skin injuries) so that eyes and body can be washed.

Recommendations for use

• *Contact lenses should be removed as soon as possible* to wash the eyes and hazardous chemicals. In any case, it is strongly recommended not to wear contact lenses in the laboratory.

-Water *should* not be *applied directly to the eyeball, but to the base of the nose*, makes flushing the eyes more effective, removing chemicals (powerful jets of water can reintroduce particles into the eyes).

-The eyelids should be forced open to ensure that they are washed behind the eyelids.

-Be sure to wash from the nose to the ears; this will prevent chemicals from entering the unaffected eye.

-Eyes and eyelids should be washed for at least 15 minutes.

-After washing, both eyes should be covered with clean or sterile gauze.

-Periodic maintenance checks should be carried out.

-Eye showers should be inspected every 6 months.

-Fixed eye showers should have protective covers to prevent the accumulation of airborne contaminants in the nozzles.

Safety showers

They are the most common emergency system for cases of projections with a risk of chemical burns and even if clothing catches fire (in which case they would be applied after the fire blanket, if available).

Features of the safety shower

-The shower shall provide sufficient water flow to soak the subject completely and immediately.

-The **water** supplied should be **potable**, and should not be cold (preferably between **20 and 35°C**) to avoid the risk of cooling a burned person in shock, and also to avoid the risk that the low acceptance of cold water may cause insufficient elimination of the contaminant by shortening the shower period. It should also be fitted with a **drain** (which greatly facilitates maintenance).

• **The shower head** should be of sufficient diameter to fully cover the subject (20 cm), with large holes to prevent clogging by limescale deposits. The distance from the floor to the base of the shower head should allow the person to stand upright (e.g. 2 to 2.3 m). The distance from the wall to the shower head should be sufficient to accommodate, if necessary, two persons (e.g. not less than 60 cm).

• **The opening valve** must be a quick-acting valve, conventional taps should not be used. The push button/actuator must be easy to catch. The most suitable models are those with a triangular actuator attached to the system by a fixed bar (rather than a chain). Foot buttons are not normally used because of the ease of inadvertently stepping on them, resulting in unintentional actuation of the system and the risk of tripping over them; an exception is systems that are actuated by standing on a platform.

• **The stopcocks or water taps** of the installation must be located in a place that is not accessible to personnel, in order to prevent the supply from being permanently cut off due to leaks or other anomalies, which, moreover, must be immediately reported and repaired. In this way, the keys will only be closed when the repairs are being carried out.

-It is useful to have an **audible or visual alarm** system that is activated when the equipment is used, so that other staff are aware that there is a problem and can come to the aid. Showers placed in changing rooms or toilets can perform the subsidiary functions of safety showers, especially in cases of small laboratories and for small burns or splashes on clothing, as they are out sight, allowing the affected person to get rid of their clothes without any complexes.

Fire safety equipment:

All fire-fighting equipment shall be red in colour (with the exception of the switchboard), as well as its corresponding signage.

Switchboards

The switchboards are designed to alert all personnel occupying the laboratory to the danger and all workers in the L.U. must be familiar with their exact location and operation to nullify any false alarm situation.

Push buttons

These are the devices by which the alarm is triggered.

Sirens

It is operated automatically by the fire control unit or manually by pressing a push button.

Fire extinguishers

Sometimes, if it is not feasible to control small fires that occur in the laboratory, due to their location, characteristics, persistence or extension, with fire blankets or wet textiles, fire extinguishers are used. Extinguishers are devices that contain an extinguishing agent or substance that can be projected and directed onto the fire by the action of internal pressure. Given that there are different types of fire, which are classified according to whether they involve solids, liquids, gases or metals, the appropriate extinguishing agent must be chosen in each case (usually the one closest to the place where the fire occurs): water spray or jet, powder, multi-purpose powder, foam or CO_2 or even a special and specific extinguishing agent (because it is a special chemical agent; for example, remember that alkalis react violently with water and/or its derivatives).

Table 5. Classes of fire and extinguishing agents

CLASES DE FUEGO		AGENTES EXTINTORES							
Identificación	Materiales combustibles	Agua	Espuma AFFF	Polvo químico Potásico	Polvo químico ABC	CO_2	Polvos especiales	Forma de acción	Observaciones
A	Papeles, maderas, cartones, textiles, desperdicios, etc.	SI	SI	NO	SI	NO	NO	Enfriamiento. Interrupción de reacción en cadena. Sofocación	
B	Nafta, gasolina, pintura, aceites y otros líquidos inflamables	NO	SI	SI	SI	SI	NO	Interrupción de reacción en cadena. Sofocación	No usar agua en chorros sólo en niebla
	Butano, propano y otros gases	NO	NO	SI	SI	SI	NO		
C	Equipos e instalaciones eléctricas	NO	NO	SI	SI	SI	NO	Interrupción de reacción en cadena. Sofocación	No usar agua espuma (buenos conductores)
D	Metales, combustibles, magnesio, sodio, etc.	NO	NO	NO	NO	NO	SI	Absorción de calor. Sofocación	No usar extintores comunes. Seleccionar el producto adecuado para cada metal

Basic notions on the use of fire extinguishers

Pull the ring: **With the extinguisher on the ground, place your hand on the top of the cylinder and pull the pin. This releases the handle and allows the unit to be activated.**

Aim: **Nozzle at the base of the flames.**

Compress: **the handle releasing the extinguishing substance.**

Sweep slowly: **With the nozzle on either side of the base of the flames. Empty the extinguisher on the fire.**

Safety precautions **Never go**

near fire.

Never let the fire come between the person and the exit of the room.

Never enter an unfamiliar area to extinguish a fire, especially in a chemistry laboratory. Report the fire to the competent person or body if necessary.

Equipped Fire Hydrants

With proper training, they can be used by any worker.

Semi-rigid

Flexible

Fire hydrants

For the exclusive use of firefighters.

Wall-mounted

From the ground

Sprinklers

It is operated automatically by the fire control unit.

Flame retardant blankets

Blankets allow effective action in the case of small fires and especially when clothing catches fire, as an alternative to safety showers. The use of the blanket can in certain cases prevent the displacement of the burning subject, which helps to limit the effect and development of the flames. The action of fire blankets to extinguish fires is intended for rapid action. An alternative to fire blankets is the use of low-combustible or pre-wetted clothing or textiles (e.g. cotton smock).

Sand or specific fire extinguishing material

They are designed to quickly and easily extinguish small fires that may occur in the laboratory. These materials must be stored in manageable containers, properly labelled, and used according to the type of fire and according to specific instructions drawn up for this purpose.

7. MANDATORY RULES FOR WORK IN LABORATORIES

7.1 Generic standards

New staff should be immediately briefed on the working rules, safety and emergency plan of the laboratory, and specific hazard characteristics of the products, facilities and operations in regular use in the laboratory. This standard should also be extended to visiting researchers and temporary contract staff of all levels (including cleaning and security staff). The following are recommendations, which should be followed systematically in the laboratory.

Personal habits and dress:

- No activity should be undertaken without prior authorisation or without adequate supervision.
- It is preferable never to work alone (when carcinogens, teratogens, reproductive toxicants or biological agents of groups 3 or 4 are used, work must always be supervised).
- The gown (securely fastened) and the personal protective equipment required for the type of work to be carried out must be worn at all times.
- Hair must always be tied back. No bracelets, pendants, wide sleeves, hoods, scarves, ties, etc., are to be worn.
- Wear appropriate footwear: do not wear sandals or other footwear that leaves the foot uncovered. It is advisable to wear long trousers and, in general, clothing that prevents substances that may fall from getting inside the footwear or coming into contact with the skin of the legs or feet.
- Hands should be washed after handling biological samples, microbiological cultures, animals, when removing gloves (see glove recommendations) and always when leaving the laboratory.
- Lab coats, gloves and other PPE or laboratory clothing must be removed before accessing areas outside the laboratory (NEVER wear lab coats to the cafeteria).
- Any material not related to the work area must be removed from the work area.
- Smoking, eating or drinking in laboratories, as well as other practices involving risk of ingestion or contact with toxic substances or pathogens (chewing gum, applying make- up, putting in or taking out contact lenses, etc.) are prohibited. In general, hand contact with mouth or eyes should be avoided while in the laboratory and before washing hands.
- Contact of chemicals, micro-organisms, laboratory material, etc. with mouth, skin and eyes must be avoided.
- It is advisable to use and store flammable substances in essential minimum quantities.
- Food and beverages should NOT be stored in the laboratory refrigerators. Laboratory containers shall never be used to contain beverages or foodstuffs, nor shall chemicals be placed in food containers.
- Do not receive visitors or hold meetings in the laboratory: there are other rooms more suitable for these activities.
- Teaching activities should be separated from research activities. If equipment needs to be used, it is not appropriate for unsupervised students or large groups to have access to specialised laboratories.
- Working or visiting a laboratory may pose a risk to pregnant women and immunocompromised or particularly sensitive persons. Such circumstances should be reported and information on the risks posed by the particular activity carried out in the laboratory should be provided.
- Avoid wearing contact lenses.

Work habits:

- It is advisable to document all activities carried out in the laboratory and incidents (laboratory notebook).
- Work in an orderly, clean and unhurried manner.
- Work tables should be kept clean, with no products, books or material unnecessary for the work being done.
- Work surfaces should be cleaned before and after the activity to be carried out. The cleaning procedure will depend on the type of activity and the substances handled. If a substance has been spilled, it should be cleaned up appropriately and in accordance with safety measures.
- Work equipment should never be used without knowledge of its operation.
- At the end of the work, ensure the disconnection of the equipment: water, pressures, electrical voltage, combustible gas and/or other gases.
- Use the right PPE for the task.
- When moving around the laboratory you should exercise caution, without interrupting others who are working.
- Do not pipette with your mouth: use a pipettor.
- If the activity requires it, fume hoods should be used whenever possible.
- Fume hoods are a means of collective protection and must not be used to store products.
- Require or provide (as appropriate) safety data sheets for reagents to be handled.
- Read the label on the packaging and consult the safety data sheets of the products before using them for the first time.
- At least the H- and P-phrases of the substances to be used (included on the container label) or the equivalences to the former R- and S-phrases must be known.
- Work material should be transported safely, using trays, trolleys, racks, stands, etc. Never use the laboratory notebook as a tray. Do not move reagents or solutions in uncovered containers.
- At the end of a task or operation, collect materials, reagents, equipment, etc., avoiding unnecessary accumulations.
- Do not use your hands to force directly on bottles, flasks, shut-off valves, etc. that have become clogged. Use appropriate protection (gloves, goggles, hoods, etc.).
- Never mix unfamiliar products without express indication.
- Put reagents back in place after use, minimising quantities in the workplace.
- For heating flammable products, use heat sources that do not produce flame, such as plates, sand baths, etc.
- When heating test tubes, avoid directing the mouth of the tube towards persons or equipment.
- If a burner is not used, it must be switched off.
- Chemicals, once removed from their flasks, must not be reintroduced into the flasks.
- The use of needles and other sharp objects should be strictly limited to those practices where they are indispensable.
- Handling biohazardous agents requires special precautions. Aerosols should be avoided, specific pipetting rules should be followed and possibly the use of biological safety hoods with dedicated material.

Packaging:

- Containers should be filled to a maximum of 80% of their capacity to avoid splashing and spillage (gravity transfer operations should be avoided whenever possible).

- Do not remove packages with unknown contents.

Labelled:

- If special precautions are required in a laboratory (work with infectious agents, substances with a specific hazard, etc.), these must be adequately signposted at the entrance.
- All bottles and containers where products have been transferred or mixtures have been prepared must be properly labelled, identifying their contents, to whom they belong and their hazard information (reproduce the original labelling).

Glass handling:

- Never force a glass tube.
- Dispose of broken glass material in a glass container, not in a waste bin.
- Do not use cracked or glass.
- Take the test tubes with tweezers. Hot glass is no different from cold glass.
- Check the temperature of containers that have been subjected to heat.

Specific standards for microbiology or pathogen laboratories:

These recommendations are specific to the laboratories that work micro-organisms (viruses, bacteria, fungi, etc.), especially if they are pathogenic.

- No contaminated samples should be taken out of the laboratory.
- Micro-organisms must always be handled around the flame.
- The generation of aerosols containing micro-organisms should be avoided as they can be easily inhaled.
- Use appropriate PPE when ultraviolet radiation.
- In the case of pathogenic micro-organisms, appropriate containment levels must be scrupulously observed.
- At the end of the task, they shall be inactivated (as appropriate) and/or disposed of as biological waste in the appropriate, clearly identified containers.

General waste management standards:

- Avoid direct contact with waste, use PPE.
- Use, whenever possible, material that can be easily decontaminated without creating additional risks to the environment.
- As a general rule, it is advisable NOT to handle waste alone.
- For liquid waste, no containers larger than 25 litres should be used to facilitate handling and avoid unnecessary risks.
- Containers of 25 litres or more must be transported by wheelbarrow to avoid risks. Also if they weigh more than 3 kg and are transported more than 10 linear metres.
- Discharge of waste into containers shall be carried out in a slow and controlled manner. Discontinue the operation if any abnormal phenomenon is observed. For transferring large quantities of liquids, a hand pump shall be used; if electric, it must be explosion-proof.
- Containers should be closed between uses.
- Waste containers shall be temporarily stored on the ground to prevent them from falling to a different level.
- Containers shall not be left in walkways or tripping hazards.

7.2 Good laboratory practice

As already indicated, the different activities that can be carried out in the laboratories of the U.Le. can generate and therefore be exposed to different environmental risks; here are some good practices to reduce these risks.

Good practices in the use of resources:

1. Equipment and utensils:

- Request equipment with the least negative effects on the environment (with non-ozone-depleting refrigerant fluids, low energy and water consumption, low noise and vibration emission, low radiation emission, etc.).
- Purchase power adapters to avoid the use of batteries.
- Choose the most durable tools that consume the least non-renewable resources and energy.

2. Materials and products:

- To know the meaning of the "ecological" symbols or marks such as AENOR Environment ecolabels, Blue Angel, ESC (Forest Stewardship Council) Certification, Environmental Quality Assurance Label, European Union Ecolabel, Scandinavian Swan, etc.
- Choose, as far as possible, environmentally friendly materials and products with certifications that guarantee proper environmental management.
- Propose and purchase (according to competences) rechargeable or less dangerous batteries (without mercury, cadmium, etc.).
- Use, where possible, products in packaging made from recycled, biodegradable materials that can be reused or at least returned to suppliers.
- Buy without excess packaging and in packaging of a size that reduces the production of packaging waste.
- Avoid aerosol products. Spray containers are similar in efficacy and less harmful to the environment.

3. Disinfection and cleaning chemicals:

- Know the pictograms and the H and P phrases.
- Know the Safety Data Sheets.
- Check that products are correctly labelled with clear handling instructions (safety and protection, storage, expiry dates, action in case of poisoning, etc.).
- Choose chemicals and disinfection and cleaning products from among those that are least aggressive to the environment (biodegradable detergents, phosphate and chlorine free; non-corrosive cleaners, chrome free; etc.).

4. Water:

- Do not let water run unnecessarily; avoid wasting water by turning off taps.
- Where possible, install pressure devices, sprays and timers on taps to reduce water consumption.
- Control the water supply to detect leaks and avoid overconsumption of water due to breakdowns and leaks.

5. Paper:

- Purchase recycled paper and paper without chlorine-based bleaches.

6. Energy:

- Avoid leaving appliances on standby or power adapters or chargers plugged in unless absolutely necessary. Use power strips with switches to ensure that appliances are completely switched off.
- When heating, use containers suitable for the size of the hotplates and cover the containers, if possible. If the hotplate is electric, it can be switched off a few minutes before the end of heating to take advantage of the residual heat.
- When using refrigerators, cookers and ovens, close the doors tightly, avoid opening the doors unnecessarily and avoid putting hot products into the refrigerator.
- Whenever possible, make the most of natural light and finish the walls in light tones or white.
- Install timers, presence (e.g. in corridors and bathrooms) and use energy-saving lamps.
- Adjust the thermostats to the temperature required in each case.

Storage of products:

- Minimise the amount and volume of hazardous products in the workplace.
- Store products and materials according to compatibility criteria, quantity and frequency of use.
- Ensure that stored items can be clearly identified.
- All containers, especially the most toxic or dangerous ones, should be sealed and properly labelled.
- Update lists of stored materials and products and manage stocks to avoid product expiry.

Use of products:

- Know and apply good laboratory practice.
- Choose from among the official methods and techniques those that involve the least risk and are the most environmentally friendly (less toxic and less hazardous; less energy or water consuming, etc.).
- Read carefully and follow the instructions for use of the products.
- Careful handling of reagents and products as well as samples to avoid errors and repetition of procedures and therefore increased waste.
- To be aware of the risks and hazards of the products used (for the safety and health of people and the environment).
- Knowing how to identify and apply, where appropriate, the health and safety regulations and environmental regulations applicable to the packaging, labelling, storage, use, transport and disposal of chemical substances and preparations.
- Use the products until they are completely used up so that the containers are empty to avoid contamination.
- Reuse materials and packaging where possible.

Laboratory equipment and instruments:

- Calibrate carefully the equipment for avoid errors y repetitions of procedures (involving an increase in waste).
- Keep equipment in operation as as necessary to avoid heat emissions, noise, vibrations, radiation, etc. and unnecessary energy consumption.
- Identify the risks of environmental contamination, derived from the incorrect use of chemical products, instruments and laboratory equipment.

Waste management:

- Provide appropriate containers for depositing each type of waste according to the management requirements.
- Use items containing recycled materials such as plastics and recycled paper.
- Use products whose packaging is highly recyclable.
- Separate waste correctly.
- Follow the guidelines for waste subject to special collection services.
- Wherever possible, reuse product packaging for the packaging hazardous waste.

Discharges:

It is forbidden to discharge into the public sewage system:

- Matter impeding the proper functioning or maintenance of the collectors.
- Combustible, flammable or explosive, irritant, corrosive or toxic solids, liquids or gases, radioactive, heavy metals, etc.
- Harmful micro-organisms or potentially reactive residues thereof.

Discharges can be **reduced**:

- Carrying out the processes carefully to avoid errors and repetitions.
- Establishing measures to correct spill situations (thus avoiding the need for clean-up).
- Choosing the clean-up agents that will reduce pollution from spills in terms of both volume and hazardousness.
- By collecting waste, segregating it at source, pre-treating it discharge or handing it over to authorised waste managers.

Should be **reduced** as far as possible:

- Volatile organic compounds (VOCs): Emissions can be reduced by keeping solvent containers closed and by using properly screened fume hoods with appropriate filters.
- Chlorofluorocarbon compounds (CFCs): their use is currently very limited, although they can still be found in older refrigeration equipment. Such equipment must be properly maintained and must be properly processed when removed, to avoid leakage of CFCs. They may also be found in aerosols and other products, in which case they should be properly removed. Some laboratory products may be or contain CFCs.
- Noise and vibration: use equipment and utensils that emit less noise and vibration as much as possible, keeping them switched off when not in use.

Specific precautions for animal testing practices

- The vaccination protocols established by the Health Surveillance Area of the Prevention Service will be followed.
- The use of disposable gowns is recommended when clothing may be stained by body fluids, blood, excretions or secretions. Other clothing used for these activities should be laundered frequently, preferably not mixed with clothing to be used for non-work purposes.
- Spilled blood drops should be cleaned up quickly with a disinfectant (e.g. bleach).
- Samples of blood and other biological materials must be shipped in a double container, properly marked, tightly closed and isolated from the outside.

- To avoid needle sticks, needles should not be reinserted into their original cap before being disposed of as waste in the waste container. Unless the syringe is to be reused, it is advisable to dispose of the syringe together with the needle, without attempting to remove the needle.

Precautions specific to the use of pressurised gas cylinders

- If possible, a specific area (separate from the laboratories) shall be set aside pressurised gas cylinders, separating full and empty cylinders and clearly marked (both cylinders and piping). Only those cylinders that are connected to equipment shall remain in the laboratory.
- Cylinders must remain in an upright position and must be anchored to vertical walls.
- The refilling of cylinders shall follow the general distribution system.
- If you are unable to operate (open) the tap of a pressurised gas cylinder, NEVER use grease, oil or similar. Notify the relevant gas supplier.
- A maintenance programme for pressure gauges, seals and piping shall be established (if not already in place) and followed by specialist technicians.

8. STANDARD OPERATING PROCEDURES (STPS)

SOPs are documents that describe the specific sequence of operations and methods to be applied in the laboratory for a given purpose. An SOP describes an operation in a unique way, which should always be followed in the same way each time that operation is performed in the laboratory.

SOPs are associated with the existence of a quality manual, and are generally used in laboratories that provide services or are involved in the manufacture of products. SOPs should be developed and established in all laboratories (practice and research). Occasionally, it may be appropriate to use SOPs in research laboratories:

- To capture routine or highly standardised procedures: Many procedures are hardly subject to change, or it is in their interest to be carried out in a very specific way. In these cases, the creation of an SOP can help to fix these procedures.
- If some kind of service is provided, even if it is not the main activity in the laboratory: The use of SOPs helps to ensure repeatability of activities and increases customer confidence. Laboratories using SOPs will have fewer difficulties if they embark on the implementation of quality policies.
- To promote the monitoring of good laboratory practices: SOPs are very detailed documents, which should focus on aspects related safety, waste management, good practices, etc. Writing SOPs can help to identify problems and promote good practice in the laboratory.

SOPs should have a descriptive title and be correctly identified, and should be written by those members of the laboratory who are most familiar with the procedure being described. The typical structure is:

Introduction: optional.

- Purpose: should clearly describe the purpose of the SOP.
- Field of application: establishes the field to which the above-mentioned working procedure applies.
- References: any documents related to or used in the preparation (standards, Quality Manual, other SOPs, etc.) are cited.
- Definitions: where necessary, definitions are given for uncommon terms that appear in the procedure.
- Responsibilities: reference can be made to the person responsible for the implementation of the SOP and the person or group of persons who are to carry out the activities of the procedure.

- Procedure: describes and details how the actions necessary to achieve the objective of the procedure are to be carried out.
- Annexes: if necessary, tables, diagrams, figures, etc. are included.

SOPs must also be approved by the laboratory manager, and if there is one, the quality manager must approve the document. Thus, each SOP must have the following identifying information on its cover page:

- SOP title.
- Identification code.
- SOP version.
- Number of total pages.
- Name and signature of the author or authors.
- Name and position of approver and date of approval.
- Name and position of the person who gives the quality approval and date.

The management SOPs implies the existence of a system for monitoring compliance, deadlines for review, control of reviews, etc. In addition, it must be ensured that SOPs are available at the site of implementation, and that staff are aware of their location.

9. HAZARDOUS WASTE MANAGEMENT AT THE U.LE. AND ITS LABORATORIES AND ITS LABORATORIES

https://servicios.unileon.es/servicios-universitarios-generales/gestion-de-residuos/ Waste generated

at the University can be separated into four main groups:

- Assimilable to urban
- Biologicals/Sanitary
- Chemicals
- Radioactive

9.1. Refuse assimilable to urban waste

They do not present risks to health or to environmental hazards. This group includes waste from kitchens, cafeterias and canteens, waste generated by administrative activities, bulky waste, furniture, rubble, inert waste. Managed by municipalities with more than 5,000 inhabitants.

Selective collection to encourage the separation of waste: glass, paper and cardboard, batteries, scrap metals, etc.

Inert waste: non-hazardous waste that does not undergo significant physical, chemical or biological transformations. Inert waste is not soluble or combustible, does not react physically, chemically or in any other, is not biodegradable, and does not adversely affect other materials with which it comes into contact in a way that could to contamination of the environment or harm human health. The total leaching, the contaminant content of the waste and the ecotoxicity of the leachate shall be negligible, and in particular shall not pose a risk to the quality of surface water and/or groundwater.

9.2. Biological / health care waste

According to the Decree of the Autonomous Community of Castilla y León 204/1994, of 15 September, on the Regulation of Health Care Waste Management, these are classified as follows:

- GROUP I: Urban assimilable waste
- GROUP II: Non-specific health care wastes
- GROUP III: Special health care or biohazardous waste
- GROUP IV: Wastes typified in specific regulations

Biological waste assimilated to healthcare waste is included in this classification.

9.2.1. Group I: Refuse assimilable to municipal waste

These are those which, although generated in health centres or laboratories, are not specific to this activity and, therefore, do not present special management requirements.

9.2.2. Group II: Non-specific health care wastes

These wastes, although generated as a result of a clinical activity, because they have not been in contact with patients or biological fluids causing infectious diseases listed in Table I, do not present any hazard.

This group includes: gauze, bandages, cotton wool, compresses with traces of blood, secretions, excretions, plasters, plasters, clothes and waste from analyses, cures or small surgical interventions, and any other similar activity not included in Group III.

List of infectious diseases	
Cholera	Tularemia
Virus Haemorrhagic Fever	Abdominal Typhus Brucellosis Leprosy
Diphtheria	Anthrax
Meningitis	Paratyphoid Fever A, B and C
Encephalitis	Plague
Q fever	Poliomyelitis
I die	Bacterial dysentery
Active Tuberculosis	Rabia
Viral Hepatitis	AIDS

9.2.3. Group III: special or biohazardous health care wastes

These wastes require compliance with prevention in handling, collection, storage, transport, treatment and disposal, as they pose risks to workers, public health or the environment.

This waste is further classified as follows:

1. Infectious: capable of transmitting any of the infectious diseases listed in Table I.
2. Anatomical waste, excluding those regulated by Decree 2263/1974, of 20 July, Regulation of Mortuary Sanitary Police.
3. Blood and blood products in liquid form.
4. Needles and sharp and/or cutting material.
5. Live attenuated virus vaccines.

9.2.4. Group IV: Wastes typified by specific regulations

In their management, they are subject to special hygienic and environmental requirements, both inside and outside the generating plant.

For the specific case of carcasses of experimental animals, in the part that affects facilities of the European Union, the recent European legislation on this matter, Regulation (EC) 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption, will be applied.

9.3. Residuos químicos

Chemical waste in laboratories are substances or preparations that almost always have certain characteristics of toxicity and/or hazardousness. The incorrect identification and storage of these wastes can constitute an additional risk to those already inherent to laboratory activity. The management of these chemical wastes at the University of Leon is based on Directive 91/689/EEC, Decision 94/904/EC and the legislation in force on the subject. Some of them have their own legislation, as is the case of carcinogenic chemical agents.

According to Law 22/2011, of 28 July, on waste and contaminated soils, hazardous waste is considered to be that which appears on the list of hazardous waste, approved in Decision 94/904/EC, as well as the containers and packaging that have contained them, those that have been classified as hazardous by Community regulations and those that may be approved by the Government in accordance with the provisions of European regulations or international conventions to which Spain is a party.

Good working conditions in the laboratory should include a programme or **"Waste Management Plan"** to ensure adequate protection of health and the environment, which in turn should be included in the overall organisation of the laboratory.

Also, for both safety and economic reasons, it is necessary to consider the possibilities of waste minimisation, trying to reuse or recycle products whenever possible, as well as to optimise stock management in order not to generate waste, reviewing expired or unused products (Creation of a By-products Exchange).

Chemical waste includes:

- **Products used or generated in the laboratory**
- **Expired reagents**
- **Reagents not out of date, but not useful**
- **Patterns**
- **Solvents**
- **Dissolutions**
- **Developing liquids**

This waste is usually produced in

- **Haematology laboratory,**
- **Pathological anatomy laboratory,**
- **Immunology laboratory,**
- **Genetics laboratory,**
- **Serology laboratory,**
- **Microbiology laboratory,**
- **Biochemistry laboratory**

- **Emergency laboratory,**
- **X-rays**

All of these require a differentiated management that is specified according to each case. Proper management of these wastes is not only a necessity in order to improve working conditions, but also constitutes a fundamental part of the application of quality and environmental management criteria in the laboratory, and is also one of requirements for the application of good laboratory practice (GLP).

Due to the problems that these wastes can present, meetings will be organised with management and service managers and supervisors to explain the proposal and the working guidelines to be followed "in situ". These will have to be accepted by the departments before the management is put into operation.

Chemicals that can be disposed of via the sewage system without prior treatment will be indicated on signs, subject to prior authorisation for discharge applied for from the relevant local council. REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (CLP)

CLP is the new European regulation on the classification, labelling and packaging of chemical substances and mixtures.

This legal regulation introduces the new system of classification and labelling of chemical substances to the territory of the European Union, which is based on the harmonised universal system of the UN (UN GHS). Hazard classes define the nature of the physical, human health or environmental hazard posed by substances or their mixtures.

Peligros físicos			Peligros para la salud		Peligros para el medioambiente	
Clases		Categorías	Clases	Categorías	Clases	Categorías
Explosivos		7[a]	Toxicidad aguda	4	Peligroso para el medio-ambiente acuático	5[g]
Inflamables	Gases	2	Corrosión/irritación cutánea	2[d]	Peligroso para la capa de ozono	1
	Líquidos	3	Lesiones oculares graves / irritación ocular	2		
	Sólidos	2	Sensibilización respiratoria y cutánea	2		
	Aerosoles	2	Mutagenicidad	2[e]		
Comburentes	Gases	1	Carcinogenicidad	2[e]		
	Líquidos	3	Toxicidad para la reproducción y lactancia	3[f]		
	Sólidos	3	Toxicidad específica – exposición única	3		
Gases a presión		4[b]	Toxicidad específica – exposiciones repetidas	2		
Reacción espontánea		7[c]	Peligro por aspiración	1		
Pirofóricos	Líquidos	1				
	Sólidos	1				
Calentamiento espontáneo		2				
Con agua desprenden gases inflamables		3				
Peróxidos orgánicos		7[c]				
Corrosivos para metales		1				

[a] Explosivos inestables y 6 divisiones (1.1-1.6). [b] Comprimidos, licuados, licuados refrigerados y disueltos. [c] Tipos A, B, C, D, E, F, y G. [d] 1(A, B y C) y 2. [e] 1(A y B) y 2. [f] 1(A y B), 2 y específico lactancia. [g] Efectos agudos (1) y efectos crónicos (4).

Tabla 1. Clases y categorías de peligro

NTP 878: EU chemicals regulation (II). CLP Regulation: basic aspects

Chemical waste requires compliance with special prevention measures as it represents a risk to health or the environment. For this reason, special care must be taken when handling, identifying and packaging them once they are used for their subsequent disposal, because if this identification is incorrect, it can constitute an additional risk to those already inherent to the laboratory activity.

They are classified into the following groups according to chemical and physical properties:

- Group I: halogenated or chlorinated solvents
- Group II: non-halogenated or non-chlorinated solvents
- Group III: Aqueous solutions
- Group IV: Acids
- Group V: Oils
- Group VI: Solids
- Group VII: Special

Group I: halogenated or chlorinated solvents

Organic liquid products containing more than 2% of any halogen and with a chlorine content of more than 1%. Examples: dichloromethane, chloroform, carbon tetrachloride, tetrachloroethyl, bromoform. These are products with different toxicological characteristics and specific health effects. This group also includes mixtures of halogenated and non-halogenated solvents, provided that the halogen content of the mixture exceeds 2%.

Group II: non-halogenated or non-chlorinated solvents

- Organic liquids containing less than 2% halogens or containing less than 1% chlorine are classified here. These products are flammable and toxic and include, among others, the following:
- Alcohols: methanol, ethanol, isopropanol
- Aldehydes: formaldehyde, acetaldehyde
- Amides: dimethylformamide
- Amines: dimethylamine, aniline, pyridine
- Ketones: acetone, cyclohexanone
- Esters: ethyl acetate, ethyl formate
- Glycols: ethylene glycol, monoethylene glycol
- Aliphatic hydrocarbons: pentane, hexane, cyclohexane
- Aromatic hydrocarbons: toluene, o-xylene

Avoid mixtures of solvents that are immiscible, as the appearance of different phases makes further treatment difficult and, of course, those that react with each other.

Group III: Aqueous solutions

This group corresponds to aqueous solutions of organic and inorganic products. It is a very large group, and it is therefore necessary to establish divisions and subdivisions, as indicated below. These subdivisions are necessary either to avoid incompatibility reactions or for further processing requirements:

1. Inorganic aqueous solutions:
    - Basic aqueous solutions: sodium hydroxide, potassium hydroxide.
    - Acidic aqueous solutions of heavy metals: nickel, silver, cadmium, selenium, binders.

- cidic aqueous solutions free of heavy metals (less than 10% acid by volume).
- Aqueous chromium (VI) solutions.
- Other inorganic aqueous solutions: developers, sulphates, phosphates, chlorides.

2. Aqueous organic or high COD solutions:
   - Aqueous solutions of dyes: methyl orange, phenolphthalein.
   - Organic fixative solutions: formalin, phenol, glutaraldehyde.
   - Water/solvent mixtures: chromatography eluents, methanol/water.

Group IV: Acids

This group includes inorganic acids and their concentrated aqueous solutions (more than 10% by volume). It should be noted that their mixture, depending on the composition and concentration, may produce a dangerous chemical reaction with release of toxic gases and temperature increase. To avoid this risk, before mixing concentrated acids in the same container, a test should be carried out with small quantities and, if no reaction is observed, the mixing should be carried out. Otherwise, the acids should be collected separately.

Group V: Oils

This group corresponds to mineral oils derived from maintenance operations and, where appropriate, from heating baths.

Group VI: Solids

Chemicals in solid form of organic and inorganic nature are classified in this group. Obsolete pure reagents in solid form (Group VII) do not belong to this group. The following classification subgroups are established within the group of solids:

- Organic solids: chemicals of organic nature or contaminated with organic chemicals, e.g. activated carbon or silica gel impregnated with organic solvents.
- Inorganic solids: chemicals of an inorganic nature. For example, salts of heavy metals.
- Contaminated disposable material: this group includes material contaminated with chemical products. Classification subgroups can be established according to the nature of the material and the nature of the contaminant, taking into account the requirements set by the authorised manager: glass, gloves, filter paper, rags, etc. Broken glass contaminated with chemical products (pipettes, test tubes, beakers and other laboratory material in general), presents risks linked to the intrinsic risks of the chemical products that contaminate it and, in addition, the risk of parenteral damage due to cuts or punctures. This glass should not be deposited in a conventional glass container, among other reasons, because it should not be subjected to the usual compaction process, but should be deposited in the appropriate specific container.

Never mix with each.

Group VII: Special

This group includes chemicals, solid or liquid, which, because of their high hazardousness, should not be included in any of the other, as well as obsolete or expired pure reagents. These products must not be mixed with each other or with residues from the other groups. Examples:

- Strong oxidants - oxidisers (peroxides).
- Pyrophoric compounds (magnesium metal powder).

- Highly reactive compounds (fuming acids, acid chlorides (acetyl chloride), alkali metals (sodium, potassium), hydrides (sodium borohydride, lithium hydride), compounds with active halogens (benzyl bromide), polymerisable compounds (isocyanates, epoxides), peroxidisable compounds (ethers), reaction residues (unknown).
- Highly toxic compounds (benzene, osmium tetroxide, chromic mixture, cyanides, sulphides, mercury, asbestos, etc.).
- Unidentified or unlabelled compounds.

In general, hazardous chemical waste shall be separated on the basis of physical and chemical properties:

- Liquids
  - Organics
    - Halogenates
    - Non-halogenated
    - Waters with high COD
    - Oils
  - Inorganic
    - Acids
    - Basics
    - Sales...
    - Solids
  - Organics
    - Halogenates
    - Non-halogenated
  - Inorganic
    - Metals
    - Sulphates
    - Carbonates...

Mixtures that make management difficult, such as multi-phase formation, should be avoided, and even if they belong to the same group, substances that may react with each other should be separated in different containers.

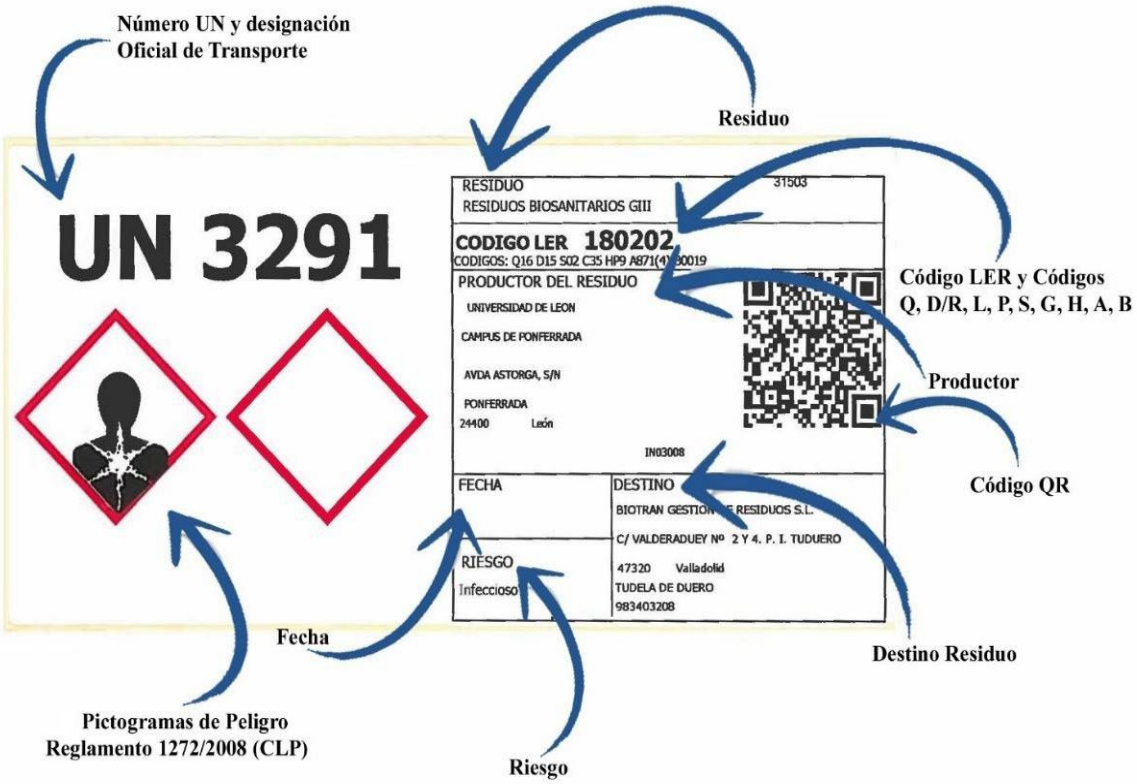
Special attention must be paid to separate peroxides from combustible, flammable, oxidising and corrosive substances.

9.4. Radioactive waste

They must be suitably conditioned and signposted in compliance with the requirements established in Royal Decree 783/2001, of 6 July, approving the Regulation on health protection against ionising radiation, until their subsequent delivery to the authorised manager (currently Empresa Nacional de Residuos Radiactivos, S.A. - ENRESA).

Although we are talking about waste, the Globally Harmonised System applies.
(see section 3.2 Chemical hazards).

ALL WASTE SHALL BE PROPERLY LABELLED



Labels must be:

The name, address and telephone number of the producer of the waste. The dates of packaging (start and end of filling).

The nature of the risks posed by the waste.

On the other hand, the regulation states that the **label bearing the pictogram must be firmly attached to the packaging**, and previous indications (outdated, erroneous, etc.) which could lead to confusion if the new label, for example, becomes detached, must be cancelled.

The label must be at **least** 10x10cm in size.

10. WHAT TO DO IN CASE OF A FIRE EMERGENCY?

Follow the general advice in the building's evacuation plans.

Los **requisitos básicos de equipamiento e infraestructura para la protección contra incendios** son:

- Vías de evacuación y número de salidas
- Resistencia al fuego de los elementos constructivos
- Instalaciones de protección contra incendios (extintores, Bocas de Incendio Equipadas o BIEs, sistemas de detección de alarma, señalización, etc.)

El **Plan de Autoprotección de cada edificio** establece los medios materiales y humanos disponibles y la forma en que se actuará en caso de emergencia.

It is the responsibility of all personnel of the U.Le. to keep the fire-fighting elements clearly visible and the escape routes clear at all times.

If it detects a fire:

♦ and the fire is controllable, make use of the extinguishing equipment in your vicinity, provided you are trained and the intervention is safe.

♦ and it is NOT controllable, communicate the emergency using the alarm buttons and evacuate the area by closing the doors and windows, if the magnitude of the fire allows it. Finally, assist in the evacuation the area and/or building and go to the assembly point.

If trapped by fire:

♦ Close doors between you and the fire. Plug the gaps around doors and openings, using rags or rugs. Wet them if there is water nearby.

♦ Find a room with a window to the outside. If you can, open it slightly.

♦ Crawl (smoke is generally less dense than air; there are some exceptions).

♦ Use a damp cloth for breathing and avoid smoke inhalation.

♦ If smoke impedes visibility and you are disoriented, always follow the same side wall (regardless of which one you choose - left or right - if it is always the same, sooner or later you will find your way out of any maze).

11. WHAT TO DO IN CASE OF AN ACCIDENT?

https://www.unileon.es/intranet/prevencion/informes/procedimiento_aatt.pdf

The general rule in the event of an accident and in this order is:

P – PROTECT
A - WARN
S- SOCORRER

Burns

-Wash with plenty of cold water for 10-15 minutes.

-Seek medical advice immediately.

Cuts

-If it is a slight cut, rinse thoroughly under running water for at least 10 minutes.

-Disinfect the area with antiseptics (from the first aid kit). Air-dry the wound or cover it with a sterile bandage.

-If it is a large cut in close dangerous areas see a doctor immediately; try to control bleeding with compression; DO NOT remove foreign bodies; avoid movement and if possible place a wet dressing or gauze.

Accidental spills on the skin

-Wash off quickly with plenty of running water.

-After washing, remove contaminated clothing as soon as possible.

-Safety showers shall be used in cases where the affected area of the body is large.

Skin and eye splashes

-Wash with plenty of running water. Use eyewash if splash in eyes.

-Do not try to neutralise.

-Seek medical advice immediately.

Action in case of chemical ingestion

-Call the toxicological information service (try to have at least the product label and/or the Safety Data Sheet available).

-Do not induce vomiting if the product ingested is corrosive.

-If the patient is unconscious, place him in a tilted position, with his head on one side and try to stick his tongue. If conscious, keep the patient propped up. Cover them with a blanket to keep them warm.

Action in case of chemical inhalation

-If the toxic vapour is a gas, wear the appropriate type of gas mask during approach to the affected person.

-Immediately move the affected person to fresh air.

-Seek medical advice immediately. Try to carry as much information as possible about inhaled gases and/or vapours of the toxic substance.

Action in case of contamination with biological material

-Seek medical advice immediately. Try to carry as much information as possible about the biological agent(s) to which you have been exposed.

-Follow the indicated preventive treatment (prophylaxis, vaccination, etc.).

Action in the event of gas leaks:

Flammable gas leaks without flame:

- ♦If possible, turn off the gas tap.
- ♦Do not use open flames or electrical appliances (do not even operate the light switch if it is dark or dark at night).
- ♦If the leak cannot be eliminated, it prevents its spread and the entry of people into the affected area.

Flammable gas leaks with flame:

In the event of a fire, all gas cylinders exposed to heat may explode, resulting in risk of projection of parts of the cylinder, pieces of the cylinder and objects in the vicinity and the gas contained therein.

- ♦If possible, turn off the gas tap.
- ♦Notify the Fire Service.
- ♦Even if the fire is extinguished, the risk still remains.
- ♦Bottles that have been affected by fire should not be handled.
- ♦If the operation is safe, remove as many unaffected bottles as possible.

12. EALTH SURVEILLANCE

The **Health Surveillance Programme** (individual and collective) proposed by the Prevention Service shall be followed in accordance with the provisions of the Law on Occupational Risk Prevention. The staff of the Health Surveillance Area must be familiar with the conditions, procedures and potential risks existing in the laboratories. In any case, the Prevention Service, through the Health Surveillance Area, may propose individual protection measures, also keeping an individual medical record.

Finally, certain personal situations must be notified to the Prevention Service in order to initiate the corresponding procedure if necessary (pregnant workers, workers particularly sensitive to certain risks, etc.); see the L.R.P. Unit folder of the L.U. on the website.

13. Bibliography

- NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK Technical Guide for the assessment and prevention of risks related to chemical agents in the workplace.
- NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK Technical Guide for the assessment and prevention of risks related to exposure to carcinogens or mutagens at work.
- NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK Technical Guide for the assessment and prevention of risks related exposure to biological agents.
- NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK. Safety and working conditions in the laboratory.
- NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK. Documentation of the Training course for the performance of basic level functions in Occupational Risk Prevention.
- INSTITUTO NACIONAL DE SEGURIDAD Y SALUD EN EL TRABAJO (NATIONAL INSTITUTE FOR SAFETY AND HEALTH AT WORK) Technical Notes of Prevention.
- Former U.Le. Laboratory Safety and Good Laboratory Practice Manual prepared by different U.Le. staff (P.D.I. and P.A.S.).

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ANEXO 1. DOCUMENTO DE ACEPTACIÓN

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NOMBRE Y APELLIDOS: **TELÉFONO DE CONTACTO:** **CORREO ELECTRÓNICO:** **NOMBRE DEL LABORATORIO:** **DEPARTAMENTO:** **MOTIVO DEL USO DEL LABORATORIO:** **RESPONSABLE DE LA ACTIVIDAD QUE DESARROLLA:**

Por la presente, reconoce que:

- Ha leído la 'Guía de Seguridad en Laboratorios para Docentes, Investigadores y Personal Técnico'.
- Se compromete a cumplir las directrices indicadas en la misma.

León, ____ de _____ de _____

Fdo.: _____

DEBERÁ QUEDARSE CON UNA COPIA DE ESTA HOJA Y ENVIAR EL ORIGINAL POR CORREO INTERNO AL SERVICIO DE PREVENCIÓN DE LA UNIVERSIDAD DE LEÓN

ANEXO 1. DOCUMENTO DE ACEPTACIÓN

universidad de león

NOMBRE Y APELLIDOS: **TELÉFONO DE CONTACTO:** **CORREO ELECTRÓNICO:** **NOMBRE DEL LABORATORIO:** **DEPARTAMENTO, ESCUELA:** **MOTIVO DEL USO DEL LABORATORIO:** **RESPONSABLE DE LA ACTIVIDAD QUE DESARROLLA:**

Por la presente, reconoce que:

- Ha leído la 'Guía de Seguridad en Laboratorios para Docentes, Investigadores y Personal Técnico'.
- Se compromete a cumplir las directrices indicadas en la misma.

Ponferrada , ____ de _____ de _____

Fdo.: _____

DEBERÁ QUEDARSE CON UNA COPIA DE ESTA HOJA Y ENVIAR EL ORIGINAL POR CORREO INTERNO AL SERVICIO DE PREVENCIÓN DE LA UNIVERSIDAD DE LEÓN

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ANEXO 2.

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FICHA DE CONTROL DE LA GESTIÓN INTERNA DE LOS RESIDUOS PELIGROSOS

DEBERÁ RELLENARSE UNA FICHA POR CADA DEPÓSITO (BIDÓN O ENVASE)

N° Registro: (No rellenar)

Persona que solicita la retirada de residuos peligrosos en el laboratorio:			
Tel.:	Fax:	Correo electrónico:	
Laboratorio:		Departamento:	
Edificio:		Planta:	Puerta:
RESPONSABLE DEL DEPARTAMENTO O GRUPO DE INVESTIGACIÓN:			

- Indique con una 'X' el tipo de residuo peligroso que contiene el depósito:

TIPO DE RESIDUO:			
RESIDUOS QUÍMICO		RESIDUO BIOSANITARIO	
Grupo I: Disolventes halogenados		Grupo I: Asimilables a Urbanos	
Grupo II: Disolventes no halogenados		Grupo II: Sanitarios no Específicos	
Grupo III: Disoluciones acuosas		Grupo III: Sanitarios Especiales o Biopeligrosos	
Grupo IV: Ácidos		Grupo IV: Tipificados en Normativas Específicas	
Grupo V: Aceites		Residuo Citotóxico	
Grupo VI: Sólidos			
Grupo VII: Especiales			
Otro. Indique el tipo de residuo		Otro. Indique el tipo de residuo	

Observaciones: _____

_____

- Tipo de depósito: ☐ Garrafa ☐ Envase ☐ Contenedor
- Volumen del depósito: _____
- Fecha de inicio de llenado (dd/mm/aaaa): (__ / __ / ____)
- Fecha de finalización de llenado (80 % de la capacidad del depósito) (dd/mm/aaaa): (__ / __ / ____)
- Firma de la persona que solicita la retirada de residuos:

Fdo. _____

- Firma del encargado de la gestión interna de residuos peligrosos en el laboratorio:

Fdo. _____

DEBERÁ DEJAR ESTA FICHA DE CONTROL FIRMADA JUNTO AL ENVASE A RECOGER

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ANEXO 3. SOLICITUD DE REPOSICIÓN DE ENVASES Y ETIQUETAS

N° Registro: (No rellenar)

Nombre del solicitante:			
Tel.:	**Fax:**	**Correo electrónico:**	
Laboratorio:		**Departamento:**	
Edificio:		**Planta:**	**Puerta:**
RESPONSABLE DEL DEPARTAMENTO O GRUPO DE INVESTIGACIÓN:			

- Indique el número de cada tipo de envase y etiqueta que desee solicitar:

BIDONES RÍGIDOS (DESTINADOS A ALMACENAR RESIDUOS QUÍMICOS)	**Núm.**
Bidón (translúcido) de **10 litros**	
Bidón (translúcido) de **25 litros**	
Bidón(translúcido) de boca ancha de **25 litros** (PARA MATERIAL DESECHABLE CONTAMINADO)	
Bidón (translúcido) de boca ancha de **60 litros** (PARA MATERIAL DESECHABLE CONTAMINADO)	

ENVASES RÍGIDOS (DESTINADOS A ALMACENAR RESIDUOS BIOSANITARIOS)	**Núm.**
Envase amarillo (Pictograma: Residuo Biosanitario) de **30 litros**	
Envase amarillo (Pictograma: Residuo Biosanitario) de **60 litros**	

ENVASES NO RÍGIDOS (DESTINADOS A ALMACENAR RESIDUOS BIOSANITARIOS)	**Núm.**
Bolsa roja de galga mínima de 300 (Pictograma: Residuo Biosanitario) de **20 litros**	

ENVASES RÍGIDOS (DESTINADOS A ALMACENAR RESIDUOS CITOTÓXICOS)	**Núm.**
Envase azul (Pictograma: Residuo Citotóxico) de **30 litros**	
Envase azul (Pictograma: Residuo Citotóxico) de **60 litros**	

ETIQUETAS (DESTINADAS A LA SEÑALIZACIÓN DE LOS ENVASES DE RESIDUOS QUÍMICOS)			**Núm.**
Grupo I: Disolv. halogenados [**Banda Naranja**]		Grupo V: Aceites [**Banda Marrón**]	
Grupo II: Disolv. no halogenados [**Banda Verde**]		Grupo VI: Sólidos [**Banda Amarillo Pálido**]	
Grupo III: Disolv. Acuosas [**Banda Azul Claro**]		Grupo VII: Especiales [**Banda Violeta**]	
Grupo IV: Ácidos [**Banda Roja**]		Otra. Indique el tipo	

Observaciones:_____

_____

- Fecha (dd/mm/aaaa): (__ / __ / ____)
- Firma de la persona que realiza la solicitud:

Fdo. _____

DEBERÁ DE ENTREGAR ESTA SOLICITUD FIRMADA AL RECIBIR LOS ENVASES Y/O ETIQUETAS

Annex 4.

ADDRESSES AND TELEPHONE NUMBERS IN CASE OF EMERGENCY

https://servicios.unileon.es/unidad-prevencion-riesgos-laborales/emergencias/

♦ Accident insurance

- Students: School Insurance is available. The forms to request the refund of the amount of care received in each case can requested through the Human Resources, the Management or, depending on the building, in the Concierges' and Students' Secretariats.
- Administration and Services Staff (P.A.S.) and Teaching and Research Staff (P.D.I.): they can be covered by the Mutual Society, if they are covered by the Social Security system.
- P.D.I.: they can be attended by the corresponding insurance companies, if they belong to MUFACE.
- Third Cycle Scholarship Holders: the U.Le. takes out an accident insurance policy, the company may vary from year to year. For further information, please contact the Research Service (Grants Section).